THE

OPHTHALMIC REVIEW,

A

MONTHLY RECORD

OF

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PARTIAL EMBOLISM OF THE INFERIOR DIVISION OF THE CENTRAL ARTERY OF THE RETINA ASSOCIATED WITH REPEATED PREVIOUS ATTACKS OF CHOREA.

By Arthur H. Benson, F.R.C.S.I.,

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James Jackson, aged twenty-one, house painter, applied at the out-patient department of Saint Mark's Ophthalmic Hospital on October 15th, 1885 (S.M.O.H. Disp. 2987). He stated that he had always been shortsighted; that on the previous evening at seven o'clock, while sitting reading after an ordinary easy day's work, and while feeling perfectly well, the sight of the right eye rapidly but gradually failed, so that within a few seconds he became totally blind of that eye. He could not even see the light with it, whilst the sight of the left remained perfect. He had no premonitory symptoms whatever, nor any abnormal sensations accompanying the loss of vision. In about three minutes the sight began to clear from below upwards, and gradually improved till in about fifteen minutes the field of vision had reached the horizontal line—there it ceased abruptly, and has since remained. The chart taken with the perimeter fifteen hours after the attack shows absolute loss of the upper half of the field, the boundary of the sentient half being a straight horizontal line coinciding with the horizontal meridian of the chart, except perhaps at the fixation point, where it appears to include rather more than the half of the

* Read before the Medical Section of the Academy of Medicine in Ireland, December 18th, 1885.

macula. No headache, giddiness, sickness of stomach, or other symptom either preceded, accompanied, or succeeded the loss or the return of the sight.

The History the patient gave of his previous illnesses is interesting :—

1. He had childish illnesses of various kinds. He had measles when three years old, followed by whooping-cough. At nine years of age he had scarlatina, and at about twelve he had small-pox lightly.

2. Four-and-a-half years ago, in 1881, *i.e.*, at age of seventeen, he had rheumatic fever, and was under the care of Dr. Bennett, of Sandymount. This lasted ten weeks. His heart was not at that time affected as far as he could tell. He says that Dr. Bennett considered that lead might have had something to do with the rheumatic fever.

3. Three-and-a-half years ago, June, 1882, he had an attack of left-sided chorea in the Meath Hospital, under Dr. Foot, which was severe for about seven or eight weeks. Dr. Foot has kindly placed the notes of that attack at my disposal. He says, "There is no cardiac murmur at present, June, 1882. The twitching had been coming on for six weeks; however, he worked up to the beginning of the week in which he was admitted. The jerkings began in the fingers of the left hand, then spread up to the shoulder, then went to the lower extremities, beginning at the hip, lastly they affected the face—left side—principally the muscles about the mouth and eye. He also felt his neck twitching. He cannot hold anything in his left hand." He did not get quite well.

4. Two years ago, 1883, he had another similar attack of chorea in the Edinburgh Infirmary, and was treated by a physician whose name he forgets. This lasted about two months, and was, he says, more general, affecting both sides.

5. Last year, 1884, he had again another attack of chorea, and was treated by Dr. Quinan. This attack lasted about two months. Each attack was less severe than the previous one, and he has since had no return.

Condition on admission.—R. with $-$ 6 D, $V = \frac{6}{18}$, tension normal, pupil active; L. with $-$ 7 D, $V = \frac{6}{6}$, tension normal, pupil active, but more responsive than in R. This was fifteen hours after the embolism occurred.

The ophthalmoscope showed the media to be clear. The upper part of the right disc was fairly normal. There was a myopic crescent and a large and deep physiological cup in which the vein was pulsating. Its lower half was hazy and whitish, so that its margin could not be determined. The retina was divided horizontally by a sharp line of demarkation, into a normal superior portion, and an œdematous inferior portion. This line ran from about the middle of the disc towards the yellow spot region, passing close to, but just below, the macula. It extended well out beyond the yellow spot, and also to the nasal side of the disc, following, with very great accuracy, the horizontal line. This line was best marked, as was also the œdema of the retina, in that part which lay between the disc and yellow spot.

The retina below the boundary line was of a whitish grey colour (œdema), fading gradually into tolerably normal-looking retina towards the periphery. On the œdematous portions the smaller vessels stood out with undue distinctness. The macula presented the typical "cherry red spot," which was horizontally oval, and surrounding it, in the more normal part of the retina, was a most distinct halo. The upper half of the retina exhibited, to a marked degree, the "shot silk" phenomena, but was otherwise perfectly normal. The vessels were all well filled with blood, though those supplying the inferior half of the retina were not quite as roundly filled as those running upwards, but pressure produced pulsation in the arteries of the affected part. Pulsation and emptying were more easily produced in the vessels of the affected than of the healthy retina. There were, however, no attenuated or empty vessels such as are usually seen in cases of embolism of the central artery. There were no hæmorrhages anywhere visible.

There was total loss of sensation in the lower half of the retina; even a strong beam of light projected upon that part of the retina was not perceived, whilst the upper half possessed acute vision.

The diagnosis of embolism of the inferior division of the central artery of the retina was made:—The urine and heart were each carefully examined at the time and found healthy, and on two subsequent occasions Dr. Hawtry Benson kindly examined the heart, and failed to discover any pathological condition whatever.

In a few days' time the œdema of the retina had markedly diminished. One small flame-shaped hæmorrhage appeared in the retina to the lower outer side of the disc. This was soon absorbed and no fresh extravasations occurred. The vessels in a few days showed a decided tendency to diminish in size, and to exhibit the appearances of thickened coats.

The subjective conditions remained unchanged, but each day the objective appearances varied in proportion as the œdema was absorbed, and the vessels shrank till, in a month's time, the retina looked practically normal, except for the vessels on its lower half, which were shrunken to a great degree and had thickened coats. One or two small brilliant yellow spots of fatty degeneration which were noted in the diseased retina near the yellow spot had disappeared. The halo round the disc was still visible, and a faint milkiness of the retina which had been œdematous still served to distinguish it from the sound part. Vision remained unchanged and tension was normal. When the circulation had been re-established, the vessels, more especially the veins of the affected portion of the retina, were smaller on the disc than a short distance away from it.

It is now (December 18th) more than two months since the accident, and the retinal changes above mentioned are only visible to a very slight degree, but the vessels, both veins and arteries, are more attenuated, and vision has in no way changed. Were it not for the history the ophthalmoscopic appearances might be difficult to account for, the only subjective symptom being the horizontal right hemianopsia.

One or two points in this case admit of discussion. Was there any etiological connection between the embolism, the three attacks of chorea, and the previous atack of rheumatic fever? Acute rheumatism is a common antecedent of chorea, and those who believe in the embolic theory of chorea, find in the cardiac complications of rheumatism an explanation of the choreic attack. To such, also, the sequence would be rendered complete when the individual got embolism of the central artery of his retina, and further probability is given in this case by the fact that it was left-sided hemichorea

that he suffered from (*i.e.*, right side of brain), whilst the embolism lodged in the right retina. Cases of this kind are, however, extremely rare. Mr. Swanzy, in the R. L. O. H. Reports,* has recorded the case of a girl, aged ten, who got chorea, and at the same time facial paralysis and embolism of the left central retinal artery. In this case, as in mine, nothing pathological could be discovered in the heart.

In my case the sudden and total blindness of one eye, followed by the recovery, in a few minutes, of half the field of vision, and permanent loss of the other half, would seem to imply that the embolus, in the first instance, blocked the central artery at or before its bifurcation, and was dislodged from that situation and washed into the inferior division of the vessel before any permanent injury was done to the retina. That this general ischæmia should occur with even a small embolic mass is quite reasonable, as any sudden obstruction, though only partial, would be likely to produce such a diminution of the tension of the blood in the retinal vessels that their coats would spasmodically contract, and, aided by the intra-ocular pressure on the vessels, serve to empty them almost to obliteration of their lumen. The mass, when dislodged, was carried into the inferior division, leaving the circulation free in the superior, and vision in it returned.

The early re-establishment of the circulation in the lower half of the retina, without the restoration of vision, and the subsequent contraction of the vessels and atrophy of the retina, may be explained, as has been done in an able article on the subject by Schnabel and Sachs (Archives of Ophthalmology, Vol. XIV., p. 262) by assuming that an embolus of irregular shape only partially filled the lumen of the branch into which it drifted The spasmodic contraction of the arteries, aided by the intra-ocular pressure, were at first sufficient

* September, 1875.

to complete the arrest of the circulation produced by the partial embolus, but that presently, the spasm passing off, permitted the blood to flow, though slowly, through the vessels, which were thus again filled, but at a lower tension than the normal.

If it be true, as Schnabel and Sachs have demonstrated, that "partial emboli" occur in the retina, it is certain that such also occur in other organs, and give rise to symptoms of permanent or temporary importance, according to the delicacy of the part obstructed. A very few hours' deprivation of blood is sufficient to destroy the function of the retina, but it may be without blood for a certain time and yet recover perfectly, as in the case observed by Wood-White (Ophth. Rev., Vol. I., 1882). Portions of the nervous centres may, in the same manner, suffer temporary deprivation of blood without permanent loss of function; and cases of vomiting, headache, giddiness, &c., &c., may, in some cases, be most easily accounted for by this hypothesis. In this connection it may be mentioned that vomiting and headache are not unfrequently associated with the occurrence of a retinal embolus.

I have not attempted to discuss the points of diagnosis between embolism and thrombosis of the retinal artery. The subject has recently been treated in full by Priestley Smith (Ophth. Rev., Vol. III., p. 1, 1884), and my case admits of no doubt.

ON THE ILL-EFFECTS OF COCAINE IN CASES OF CATARACT EXTRACTION.

By E. W. Wood-White, M.B.,

Surgeon to the Birmingham and Midland Eye Hospital.

Till quite recently ophthalmologists have been almost unanimous in their praise of cocaine as an anæsthetic agent in operations on the eye. A reaction now seems to have taken place, as might have been expected, and the disadvantages which it possesses are being recorded.

As the drug is so extensively used it is most important that we should be fully aware of these, but I think there is some danger that cocaine may be unduly blamed for unfortunate results for which it is only partially, if at all, responsible.

In the November number of the "Ophthalmic Review" (Vol. IV., p. 337), a paper by Bunge is abstracted, entitled "The injurious effects of cocaine on the cornea." He instances several cases occurring in the practice of Graefe, at Halle, where cocaine was used in the extraction of cataract, with the result that the cornea was affected in different ways, viz., "destruction of corneal epithelium, vesicular eruption on the cornea, and parenchymatous changes, with considerable opacity in the corneal tissue." He states that there could be no doubt that the mischief in question was due to the cocaine, for the corrosive sublimate solution, which had previously been systematically used in the clinic prior to operation, had never been found to affect the cornea. My experience leads me to think that the keratitis described by Bunge may have been caused by the simultaneous use of cocaine and perchloride of mercury solution. I have been in the habit of washing out the conjunctival sac with an antiseptic solution in cases of extraction, and till recently boracic acid was the agent used. Thinking, then, that corrosive sublimate was a more reliable antiseptic, I used it in five cases, together with cocaine, with the result that in each one of these five cases the cornea became more or less affected. On removal of the dressing on the second day a pearly-white cloud, in the substance of the cornea, was observed extending downwards from the section—which was a modified Graefe in all cases—in two of the cases quite obscuring the pupil. The opacity cleared up in a few days without leaving any cloud; nevertheless, it was sufficiently alarming to prevent me from again using the mercury solution. I reverted to the boracic solution, and have performed several more extractions without any similar trouble.

For the last year all my extractions have been performed when the eye was under the influence of cocaine. In no case has there been any keratitis, excepting in the five, in which perchloride of mercury solution was used as well as cocaine. I cannot think that this is a mere coincidence. I know that when corrosive sublimate solution is used alone, such results do not happen. I think, therefore, the inference is that the condition of the cornea in my cases was due to the use of the drugs at the same time. It is possible that cocaine may temporarily so reduce the resisting power of the cornea that it is more susceptible to the irritating effects of a mercury solution.

TWO CASES OF RETRO-OCULAR TUMOUR.

By E. F. Drake-Brockman, F.R.C.S.,

Surgeon-Major Madras Medical Service; Superintendent Eye Infirmary, Madras; and Professor of Physiology and Diseases of the Eye, Medical College, Madras.

Case 1.—Soobiah, male. aged 25 years, a coolie, was admitted into the Eye Infirmary, with loss of useful vision of the left eye of one month's duration. States that four months ago a swelling appeared in the region of the caruncle about the size of a peppercorn, the eye became very red and there was a muco-purulent discharge. Three months from that date vision began rapidly to fail and the eyeball to protrude, with considerable pricking pain; fifteen days ago a chemotic state of the lower half of the conjunctiva set in.

The patient is a well-made and well-nourished man, in good health. Suffered from gonorrhœa or syphilis three years ago, and subsequently from rheumatism. There are no signs, nor is there a distinct history of syphilis. There is considerable proptosis of the left eye, which is directed outwards towards the outer canthus by a growth situated along the inner wall of the orbit and forming a semi-elastic swelling at the inner canthus. The movements of the eye are diminished in every direction and completely lost inwards. The eye itself is con

gested, the pupil dilated and fixed. The chemosed conjunctiva projects considerably forwards and hides the lower lid; no pain at present. The optic disc swollen, the margin blurred, the physiological cup almost entirely absent, the veins full and tortuous; the fundus otherwise normal.

On a more careful examination the canaliculi and the nasal duct were found to be patulous; a probe could be passed directly backwards into the orbit into a semi-elastic mass at the inner canthus for some distance, at which point a sensation of broken down elastic tissue was communicated to the probe. The swollen conjunctiva was radially divided; fomentations were applied; cod liver oil and the syrup of the iodide of iron were ordered.

17th September.—The skin of the upper lid at the inner canthus has ulcerated; the movements of the eyeball are more freely executed; no change observable in the state of the fundus of the eye. Perception of light slight.

5th October.—The thickening along the lower lid and floor of the orbit is less; movements of the eye more free. As the ulcer has a suspicious look, as if syphilitic, the treatment has been changed to the inunction of mercurial ointment.

12th.—Slight tenderness of the gums is showing itself, and the inunction has been diminished; the ulcer is healing rapidly, and the chemosis is subsiding; the dimensions of the tumour have much diminished.

19th.—Has made rapid improvement; the ulceration of the lids has all but healed; the chemosis is fast disappearing; the movements of the eyeball are free; the hard thickening of the orbital cavity has almost entirely gone. The inunction continued.

24th.—The eversion of the lower lid is reduced; the chemosis and swelling have disappeared; the movements of the eyeball have been almost entirely regained; the ulceration of the lids has healed. The thickening in the orbital cavity is much reduced, and can only be felt deep down at the floor and inner side of the orbit; the general health of the patient has much improved.

The ophthalmoscope shows the disc margin at the apparent lower and outer part to be irregular and blurred, and the course of the vessels hidden by effused deposit; the veins are not so

full or tortuous ; the arteries are very small ; slight absorptive changes have been progressing in the vicinity of the disc. Otherwise the fundus is normal.

The patient states that the vision has improved, but owing to his extreme ignorance it is impossible to accurately test the degree of improvement.

Case 2.—Deraswamy, aged 5 years, a male Hindoo, was brought by his mother to the Eye Infirmary on the 19th May, 1881, with the statement that since the child's birth she has noticed an undue prominence of the left eye, a condition which has become more pronounced within the last year. The eyeball is protruded beyond the palpebral fissure to fully one-half of its entirety, being displaced in a direction outwards and upwards. The vision of the eye is impaired, but it is difficult to ascertain to what extent. On inserting the tip of the finger beneath the eyeball and pressing in a direction backwards, a firm elastic swelling can be felt situated far back in the orbital cavity. The growth can be traced towards the inner and outer sides, and appears to surround the optic nerve upon which it exerts pressure. The superficial structures of the eyeball are in a normal state ; there is no glandular enlargment anywhere ; no pain is complained of ; a persistent lachrymation is present ; there is an absence of throbbing of the carotids and of any signs of vascular growth. The lad is fairly nourished.

The disc is atrophied, and for the most part quite obscured by a congeries of blood-vessels, the apparent lower and inner margin being alone visible. The remainder of the fundus looks congested, but there is nothing of special pathological interest to notice.

4th June.—Under chloroform an incision was made along the inferior retro-tarsal fold and the anterior extremity of the growth exposed. On examination by the finger the growth was found to extend backwards towards the apex of the orbital cavity and to surround the optic nerve ; its movements corresponded with those of the eyeball. As there appeared to be no chance of removing the tumour without the eyeball, enucleation was performed, and the tumour, which extended far back into the orbital cavity, was at the same time removed. The patient made a good recovery.

The growth took its origin in the structure of the optic nerve. It measured nearly two inches in length, was ovoid in form, firm to the touch, and smooth on the surface, in diameter it measured one inch. The distance between the eyeball and the anterior portion of the tumour was about one-third of an inch. On examining sections of the tumour it presented the appearances of a fibroma in very close connection with the fibrous structure of the epineurium, the perineurium, and the endoneurium, causing considerable pressure on the nerve fibres, and altering their histological structure to a very marked degree. The coats of the central artery of the retina had become also much thickened, almost entirely occluding the channel of the vessel. At frequent intervals throughout the tumour vascular spaces are to be seen lined by endothelium. The axis cylinders of the compressed nerve fibres are to be seen stained with the colouring agent, but the medullary sheath of the fibres is not visible after the action of the hardening agents upon the tissue.

E. Fuchs (Vienna). Contributions to the Normal Anatomy of the Human Iris. *V. Graefe's Archiv., XXXI., p.* 39, 1885; and *Klin. Monatsbl. f. Augenheilk, Nov.,* 1885, *p.* 467.

In spite of the vast amount of labour already bestowed upon the anatomy of the iris, Fuchs calls attention, in these papers, to certain details hitherto unnoticed, and to certain erroneous opinions. He has specially studied the superficial aspects of the membrane with reference to their anatomical causation.

The anterior surface of the iris can be studied in the living eye by means of a magnifier, but as this is possible only with a glass of low power, and as the periphery is hidden beneath the edge of the sclera, a complete examination must be made upon irides removed from the eyes of dead subjects. Permanent preparations can be made by embedding the membrane in glycerine jelly between two pieces of glass, after preparation by Priestley Smith's method, the best plan being to embed one half and to make microscopic sections from the other, so as to compare the surface appearances with the histological structure.

The surface relief is studied better in the brown iris than in the blue or gray, the transparency of the latter showing the deeper details too clearly.

A brown iris with medium-sized pupil presents the following appearances:—The small circle divides the iris into two zones, pupillary and ciliary. The *pupillary zone* has an average breadth of 1 mm. It is crossed by a number of elevated ridges which spring from the small circle and converge towards the pupil, meeting and uniting with each other at acute angles; between these lie depressions, on the floor of which a fine brown network is visible under a high power. The pupillary margin is overlapped by the dark-brown edge of the pigment layer. The small circle of the iris is a ring-like projection of zigzag shape which divides the ciliary from the pupillary zone, and from which ridges run inwards and outwards into these zones.

The ciliary zone constitutes greater part of the iris; it may itself be divided into three zones—the flat, the plicate, and the peripheral. Of these the flat zone is the most internal; in it, and in the adjacent plicate zone, the vessels and nerves are more or less visible through the anterior pigment layer. They appear as bright cords separated by dark interspaces. The plicate zone is distinguished from the last by a series of nearly concentric furrows, from one to seven in number, representing folds in the tissues; the grooves appear sharply cut and deep when examined under a high power. The marginal zone begins at the outermost furrow of the plicate zone; it is characterised by a number of apertures in its surface, giving it a sieve-like appearance. The vessels here unite to form larger trunks, which cross the ciliary zone in bundles of from two to five, the interspaces between the larger trunks being freely crossed by smaller vessels. The pigment seen in the apertures between the vessels gives a dark tint to this portion of the membrane. The ciliary zone is partially, if not entirely, hidden by the edge of the sclera in the living eye. Its breadth varies in different eyes from $\frac{1}{5}$ to 1 mm. The appearances presented by blue and gray irides are complicated by the greater transparency of the membrane, by reason of which the vessels are more evident and the sphincter of the pupil is often discernible as a circular band somewhat differently coloured from the other structures, of equal width throughout, and corre-

sponding by its outer edge more or less closely with the small circle of the iris. In the ciliary zone of the light-coloured iris the vessels are so clearly visible that one can hardly believe that they are everywhere covered by the cells of the anterior limiting layer. The folds of the plicate are revealed only by the bends of the vessels, and are less manifest than in the dark-coloured iris. The dark pigment of the posterior surface is to some extent visible in the spaces between the vessels, especially at the extreme periphery, where, by reason of the many small apertures, it sometimes gives the appearance of a well-marked dark ring. This is chiefly observable in children, for in them the iris is usually of light colour and thinner than in adults.

The anterior surface of the iris is covered by endothelium. Immediately beneath this the iris-stroma is much richer in cells than elsewhere, and is therefore distinguished here as the anterior limiting layer. Its fibres are of extreme fineness, and run for the most part perpendicular to the surface. At the surface they form an extremely fine boundary line, broken in many places by the apertures which have been already described. The anterior limiting layer is thickest in the flat portion of the ciliary zone and on the prominent ridges in the plicate portion.

The cells of the anterior limiting layers send a large number of processes towards the surface, which, blending together, form a continuous protoplasmic film overlying the cells. In many cases there are small wart-like elevations on the surface of the iris, which belong to this protoplasmic membrane. In all eyes, except those of albinos, the cells of the anterior limiting layer contain pigment; and upon its amount depends the colour of the iris. In light eyes it is scanty, and the cells are so transparent that the underlying vessels are very clearly seen through it. The pigment spots and patches—so-called nævi—often seen in irides of light colour, are situated in the anterior limiting layer, the cells of the area in question being densely crowded with pigment granules, and prominent above the general level.

The small circle of the iris corresponds to the insertion of the pupillary membrane in the fœtus, and in the adult contains the circulus arteriosus iridis minor. Immediately to the outer side of the small circle, and to some extent to its inner

side also, lie the crypts—the apertures already referred to. A radial section of the iris passing through one of these crypts shows that the aperture is continued deeply into the substance of the membrane. The anterior limiting layer bends round into the opening of the crypt, and lines its interior surface, becoming thinner by degrees, and disappearing entirely at some distance from the surface. The crypt is therefore not a blind depression in the surface, but the entrance to a lymph space in the substance of the iris. The channel is not very sharply defined, but is bridged across by fine trabecular. If the external opening of the crypt is sharply cut the endothelial covering of the iris leaves off at its margin, but if the margin is rounded or sloping the endothelium is continued into the cavity. It might be supposed that in the living iris the crypts are closed externally by a prolongation of the endothelium across their apertures, but silver staining in perfectly fresh specimens proves that this is not the case: the crypts open freely into the anterior chamber, and beneath the surface they communicate with each other. The apertures in the ciliary zone are very similar to the crypts, inasmuch as the endothelium and the anterior limiting layer are interrupted at their margins, and they are continuous with the channels in the substance of the iris.

To understand the arrangement of these channels in the substance of the iris, the second or vascular layer of the membrane must be specially studied. This layer fills the space between the anterior limiting layer in front, and the posterior limiting layer behind: it is made up of the vessels with their thick adventitia, fine fibrillæ of connective tissue, and a network of branching cells. It is of open, sponge-like structure, but not equally so in all parts. Close to the limiting layers in front and behind its structure is denser than elsewhere, in accordance with the arrangement of the blood-vessels. These lie in three layers, viz., a capillary plexus in front and behind, next to the limiting membranes, and between these a layer containing, in addition to capillaries, the arteries and veins. Around these latter the tissue is remarkably open, for apart from the cellular network accompanying the adventitia, there is hardly any stroma. In front of the vessels and behind them there are large open spaces, bridged over only by the finest

fibres of connective tissue, and communicating freely with each other; they are not sharply cut off from the stroma of the iris, but are continuous with its lymph channels.

There is, therefore, in the substance of the iris, a system of slit-like channels which, besides communicating with each other and with the lymph spaces in the stroma of the membrane, are continuous with the meshes of the ligamentum pectinatum, and open by wide mouths into the anterior chamber, viz., by the so-called crypts and by the smaller apertures in the ciliary zone.

The posterior surface of the iris presents a series of radiating folds, which converge towards the pupil; and in the pupillary zone an additional number of short, fine folds give to this part a very finely plicate surface. Besides the radiating folds there are furrows and ridges running concentric with the margin of the pupil. To ascertain the mode of production of these folds the pigment layer must be studied in section. It consists of two distinct layers, of which the posterior is much the thicker, and consists of many rows of cells, while the anterior is made of flat cells immediately adherent to the posterior limiting membrane. At the pupil-margin these two layers are continuous the one with the other; at the ciliary border they are continuous respectively with pigment epithelium and with the pars ciliaris retinæ. It would therefore, as Schwalbe has said, be correct to speak of this layer of the iris as the retinal layer rather than as the uveal layer. The concentric ridges visible on the posterior surface belong exclusively to the posterior of the two pigment layers. The radial folds, on the other hand, include the hinder layers of the iris tissue proper, near to the pupil. The anterior of the two pigment layers is quite free from folds, while the posterior is much folded upon itself, and as this folding varies with changes in the size of the pupil, it follows that the one layer must to some extent glide upon the other, and as a fact the union of the two is here extremely slight, whence it comes that in inflammatory states the posterior layer readily separates and remains adherent to the lens capsule.

In front of the pigment layer lies the posterior limiting membrane. This consists of fine radiating fibres, which display no nuclei; the nuclei which some authors have described as occurring in it belong to the anterior part of the pigment

layer. This membrane is, therefore, not of muscular nature; and since there is in front of it radially-arranged muscular fibres, the existence of a dilator muscle must be denied.

Changes associated with contraction and dilatation of the pupil were studied by Fuchs both in the living eye, and, so far as was practicable, in microscopic preparations. In the healthy living eye variations of the pupil from 1·25 to 9 mm. may be obtained with eserine and atropine. After death the greatest differences in the *post-mortem* preparations were 1·7 and 5·5 mm., and Fuchs found, as Ulrich had previously done, that atropine used immediately before death effected no lasting dilatation.

When the pupil contracts, all the zones of the anterior surface, including the black border of the pupil, become broader. The sphincter also, as may be sometimes seen in light-coloured eyes, increases in width, though less in proportion than the rest. The small circle, which with a medium-sized pupil stands over the outer edge of the sphincter, is now removed outwards from it. The whole of the tissues are stretched in a radial direction; the vessels are straightened; the circular furrows are flattened; the zigzag outline of the small circle becomes more pronounced; the crypts in its neighbourhood are drawn out into narrow slits, or almost closed. The marginal zone is brought more into view as it is drawn out from under cover of the sclera. The radial folds of the posterior surface become steeper and more prominent, while the circular furrows, like those of the anterior surface, are flattened out. Radial sections show that the thickness of the membrane is reduced during contraction of the pupil by $\frac{1}{3}$ to $\frac{1}{5}$.

When the pupil dilates, the changes are the opposite of those just described. The pigment border becomes narrower, and with wide dilatation disappears entirely; the small circle changes from a zigzag to a prominent ring, which overlies the sphincter; the vessels become strongly convoluted, the furrows very deep: the crypts open more widely, or, with extreme dilatation, are transformed into slits in the opposite direction, and have then an area not larger than in medium dilatation; the peripheral zone disappears entirely behind the sclera. The circular ridges on the posterior surface become more prominent; the fine radial folds in the pupillary zone flatten out, and, with

wide dilatation, probably disappear entirely. The membrane thickens, the increase being chiefly in the pupillary zone, so that in section it has now a club-like form.

The above-named changes show that the posterior limiting membrane is the only structure which takes an active part in causing dilatation of the pupil, for it is the only one which is not thrown into folds when the pupil dilates. The pigment layer is drawn back from the margin of the pupil, because it is closely adherent to this membrane. If the dilatation were caused by the contraction of any tissue lying in front of the posterior limiting membrane, the pigment layer would rather tend to protrude than to disappear. The blood-vessels cannot be concerned in dilating the pupil, for they are thrown into strong convolutions, and manifestly tend to displace the stroma towards the pupil, as compared with the posterior limiting membrane. Dilatation of the pupil can, therefore, be due only to a contraction of this membrane. Whether the action is one of simple elasticity or whether it depends on active contraction must at present remain an open question, for there are obstacles to the acceptance of either view. On the one hand, we know that when the action of the sphincter is absolutely in abeyance through paralysis of the third nerve atropine still increases the size of the pupil, and a similar phenomenon is presented in the horseshoe-shaped enlargements produced by atropine in a pupil, the greater part of which is adherent to the lens; this looks like active contraction of a muscular tissue. On the other hand, the posterior limiting membrane is certainly not of muscular nature, for it possesses no nuclei and its fibres differ in other respects from those of muscle. Are we justified in ascribing to such a tissue the function of active contractility?

Changes in the size of the pupil are associated with changes in the superficial openings of the lymph channels, which traverse the substance of the membrane. Thus, when the pupil contracts, the apertures in the pupillary zone become narrower, and those at the periphery enlarge; when the pupil dilates, the opposite changes occur. The existence of these channels and their free communication with the anterior chamber are facts of much physiological importance. They doubtless favour the gliding of one layer of the membrane on another, which occurs with alterations in the pupil, and they

are concerned in the interchange of fluids in its tissues. Hitherto it has been assumed that the whole of the iris-lymph finds exit through the meshes of the ligamentum pectinatum, but this is certainly incorrect; normal lymph and also exudations of blood and serum in inflammatory states pass along the channels in the substance of the iris, and through their open mouths into the anterior chamber. It is probably through these channels also that the iris absorbs morbid fluids from the anterior chamber; the white corpuscles wander outwards from the vessels, take up foreign particles, and ultimately return with them into the circulation. The movement of fluids in the channels is doubtless expedited by contraction and dilatation of the pupil. The changes of the intraocular pressure which are caused by atropine and eserine are probably to some extent dependent on the anatomical features here described.

[By means of lateral focal illumination and a concave mirror of very short focus one can study, in one's own iris, many of the details described by Prof. Fuchs. Placing the ophthalmoscopic lamp at about six inches from the temple, holding a 2in. bi-convex lens against the external margin of the orbit, so as to condense the light upon the iris, and looking into a 1½in. concave mirror held in front of the eye, I can obtain an admirable view of the details of my own iris (light-coloured), including the circular contraction-furrows near to the periphery, the vessels, the corrugated pigment ring at the margin of the pupil, and a faint indication of the sphincter. Changes in the size of the pupil are obtained by turning a little towards or a little away from the lamp, or by slightly altering the distance of the mirror so as to view the reflected image with varying degrees of accommodation; by this means the changes which occur in the parts above named can be observed.—P. S.]

B. WICHERKIEWITCZ (Posen). **A New Method of Removing Unripe Cataracts.** *Klin. Monatsbl. F. Augenheilk, Nov.*, 1885, *p.* 478.

The author's method is in principle the same as that lately described by Dr. McKeown at a meeting of the Ophthalmological Society. (*Vide O. R. Vol. IV., p.* 345.) It consists in

injecting into the anterior chamber, under light pressure, a stream of water or other non-irritating fluid, and thus detaching and washing out the portions of lens-matter left behind when the usual steps of the operation are completed.

For some years, so he tells us, he has cherished the idea that unripe cataracts might be cleanly removed at a single sitting by irrigating the capsule through the opening in its anterior wall. Being accustomed, however, to perform all cataract operations without anæsthetics, and yet recognising that anæsthesia would be essential to the safe execution of such a measure, he made no experiments in this direction until the introduction of cocaine afforded the requisite conditions. The instrument used is figured in the article before us; the author christens it an "undine." It is a globular glass vessel, as large as a small orange, provided with two tubular spouts; the one is about half an inch long and has a wide mouth, which is closed by the finger of the operator when the fluid is not wanted to flow; the other is longer, suitably curved, and ends in a fine silver nozzle, with a minute hole in its upper surface, through which the fluid escapes when the finger is removed from the larger orifice. The advantage of the undine over an ordinary syringe is that it provides a continuous stream at a gentle pressure.

The fluid hitherto employed has been a one or two per cent. solution of boracic acid, boiled, and subsequently cooled to about 30 c.; the instrument is held in the right hand, the larger orifice being closed by the finger, the nozzle is passed slowly into the anterior chamber and behind the edge of the pupil; the finger being then removed, the fluid escapes in a fine stream, driving the fragments of cortex before it, which swell up and disintegrate under the operator's eyes. When the pupil is perfectly clear the nozzle is slowly withdrawn from the chamber, the stream still flowing.

At the time of writing Wicherkiewitcz had operated thus in eighteen cases, the details of which he reserves until larger statistics are available. He affirms on the basis of this experience that irrigation carefully carried out in the manner described is well borne by the eye, and that it is of conspicuous advantage in the removal of unripe senile, traumatic, and lamellar cataracts. In the treatment of the latter form especially it effects a great saving of time; thus, in a boy aged

8, suffering from lamellar cataract, he needled the right capsule and seven days later made a linear incision three to four mm. long; pressure on the cornea brought hardly any lens-matter out, but irrigation quickly softened it and brought it away. Three weeks after the needle operation the middle of the pupil was quite clear.

Perfect steadiness on the part of the patient as well as on that of the operator is essential to the safe performance of the irrigation. In adults this may usually be attained with the help of cocaine, but in children a general anæsthetic should usually be used.

Boiled distilled water meets the requirements of a simple and safe irrigation, but it will probably be found well to add to this some disinfecting agent; further experiments must determine what this should be. The two per cent. boracic acid solution has proved innocuous, but it is probably a very feeble antiseptic. In one instance, through a mistake on the part of an attendant, a carbolic acid solution was used (the strength is not stated) to irrigate the chamber after an extraction; the error was at once discovered and water was thrown in to wash out the irritant. Sharp reaction with pain and chemosis followed, but were not of long duration, and the case ultimately did well.

E. Emmert (Bern). Keratitis Dendritica Exulcerans Mycotica; a hitherto undescribed form of Ulcerative Inflammation of the Cornea. *Centralbl. f. Prakt., Augenheilk., Oct.* 1885, *p.* 302.

In the published transactions of the last International Medical Congress will be found a description by Prof. Hansen Grut of a peculiar form of mycotic keratitis which he had had frequent opportunities of studying. His description is accompanied by excellent drawings showing the serpiginous or branching character of the infiltration in the cornea. There can be no doubt that the affection designated by Emmert, appropriately enough though somewhat lengthily, by the name given above, is the same as Hansen Grut's form of keratitis, to which, however, he gave no name. The summary

given by Hansen Grut of the characteristics of the disease may be translated as follows :—" A keratitis which is essentially superficial and of little density, with great tendency to propagation by nodules and branches (boutons et rameaux), the edges of which are much denser than the central portions; its course is rather chronic; injection photophobia and pain are very slightly marked; the nature of the disease is probably mycotic." He is unable to ascribe any cause for its appearance. It was more frequently met with in men than in women, and never in children. In most cases it is not preceded by any injury, and it is certainly not associated with any inflammatory condition of the conjunctiva or lachrymal passages.

According to Emmert, who makes more extensive generalisations than his six cases, all of which are given in full in his paper, seem to justify, the disease occurs in scrofulous and phthisical individuals, men as well as women, from all classes of society, between the ages of 20 and 45. Usually they are persons who have had no previous affection of the eyes. The disease occurs suddenly, without known cause, in the months of February, April, August, and September, and very speedily produces marked photophobia lachrymation and swelling of the upper lid. "At the same time there arises a grayish subepithelial opacity in some part of the cornea, either from the scleral border or separated from it by an apparently healthy portion of the membrane. This begins either as a small nodule, from which branches are sent out, or as a small linear opacity, which becomes elongated and sends out sprouts to either side; the epithelium covering these subepithelial opacities is soon cast off, so that a series of small channels is formed. The main branch, as well as the subsidiary ones, always remain narrow." Bacilli are to be found in numbers in the detritus scraped from the ulcerated channels.

It is surely somewhat rash nowadays, when so much is written in all branches of ophthalmology, to assume that *anything* has not been previously described, but Hansen Grut's communication has probably escaped notice, owing to its having been written in French, Emmert's "hitherto undescribed, &c.," referring to German literature alone. B.

FORTUNE ADOUL (Montpellier). The Diagnosis and Treatment of Entropion. *Thesis*, 1885.

The writer claims for Nicati to have first established the differential diagnosis between trichiasis, the result of a disease localised to the lid border producing deviation of the hairs by atrophy of the border, and entropion, the turning in of the lids without any lesion of the lid border. He gives a long list of the various operations that have been employed for the treatment of entropion under the following heads :—Dermatoplastic; tarsoplastic; marginoplastic, from which, however, he omits the operation of transplanting a mucous flap, as proposed by van Millingen, and practised at St. Mark's Ophthalmic Hospital, Dublin; conjunctivoplastic; canthoplastic.

Of these he advocates, for the upper lid, the tarsoplastic operation of Nicati, consisting of excision of the tarsus with advancement of the levator palpebræ superioris, done as follows :—Having everted the lid and attached a suture to the fascia of the levator palpebræ above the upper edge of the tarsus, which suture is held by an assistant, he separates the whole tarsus from its insertion by a curved incision at its upper border, made from the conjunctival surface. It is then separated from the skin and orbicularis by dissecting from this incision towards the free border till the skin of the intermarginal space is visible. Then the two ends of the suture are passed along the cutaneous surface of the tarsus, out through the intermarginal space a short distance from each other, and fastened over a couple of beads. The tarsus is excised, and the sutures are finally removed in a week or a fortnight. The advantages claimed for this procedure are—that it is done entirely from the inner aspect of the lid; that it does not engage the skin or the lid margin; and that it is absolutely effective for entropion following on granular ophthalmia.

For the lower lid he recommends the conjunctivoplastic operation of Nicati, performed as follows :—A cutaneous flap is marked out horizontally four or five millimetres from the ciliary margin and detached at both extremities, its centre being left attached. The tarsus is then divided horizontally from within along its whole length, the incision being made along the line of greatest curvature, and a button-hole is made in the orbicularis, through which the skin flap is drawn, in

order that it may be sutured into position between the edges of the conjunctival wound. These operations are certainly ingenious, but until they have been tried in a larger number of cases and the results watched during an extended period, no certain opinion can be formed as to their real place in the operative treatment of entropion.

CHARLES STEDMAN BULL (New York). **Abscess of both Frontal Sinuses and of Ethmoid Bone. Operation and Complete Recovery.** *Trans. Americ. Ophthal. Soc.*, 1885.

A widow, aged 53 years, while chopping wood fourteen years ago, was struck by a large piece on the bridge of the nose and forehead with such force as to knock her down. It made an ugly lacerated wound, about three inches long, running downward and to the left across the bridge of the nose, and ending at the lower border of the left nasal bone. Both nasal bones were fractured and the septum displaced to the right. The parts swelled so as to close the right eye entirely, and the wound suppurated profusely for several weeks. Since then the patient suffered at times from a sense of pressure over the eyes, lasting for a few days and then subsiding. Four years ago an elastic swelling appeared at the upper and inner angle of the right orbit, which at first could be made to disappear by pressure, but gradually increased till the eye was entirely closed by the swelling and the complete ptosis. At intervals attacks of acute inflamation, with much pain, appeared in the parts.

When the patient came to Dr. Bull, he found an elastic, firm, resistant tumour at the upper and inner angle of the right orbit, extending backward under the superior orbital margin. There was complete ptosis, and the eye was pushed downward, outward, and forward, was almost completely immovable, and had $V=\frac{20}{70}$, that of the left eye being normal. Having decided that there was distension of the frontal sinus, Dr. Bull made an incision two inches long through the upper lid, just beneath the orbital arch and parallel with it. Through the wound in the skin and fascia two to three ounces of fœtid pus was evacuated, and it was found that the right frontal sinus was greatly distended, its floor and the septum between it and

the left sinus being worn away, and the abscess cavity extending also into the body of the ethmoid. The cavity in the ethmoid was separated from the orbit only by periosteum, but no communication existed apparently between the pus cavity and the nasal fossa. The cavity was washed out first with carbolic acid solution (five per cent.), then with mercuric bichloride (one to two thousand), and a drainage tube inserted. The parts were syringed and dressed frequently, and in six weeks had entirely healed. Three months after the operation the ptosis and proptosis had disappeared, but the eyeball was still on a somewhat lower plane than the left. $V = \frac{20}{40}$ and binocular single image obtained. The fundus showed nothing abnormal except a slight discoloration of the temporal half of the right optic disc. (The state of the fundus before operation is not mentioned.) Eight months after the operation recovery was complete. Dr. Bull considers that the violence caused periostitis, followed by degenerative osteitis and caries, first of the nasal process of the frontal bone and ultimately extending into the right frontal sinus, and so backward as well as to the left side.

DIANOUX (Nantes). **Visual Troubles in Exophthalmic Goitre.** *Annales d'Oculistique, October-Dec.*, 1884.

From observations made upon thirteen cases, Dianoux concludes that exophthalmic goitre is generally associated with more or less eye-trouble, due to disturbances of innervation. He divides these troubles into three classes—viz., those of movement, nutrition, and vision.

The *motor* disturbance is usually an incomplete paralysis of accommodation, productive of asthenopia, and often associated with mydriasis. This asthenopia is remarkable for its sudden appearance and for its variations during different stages of the disease. Vasomotor paralyses are referred to under the same heading.

Nutritive disturbance is seen in the occurence of a form of keratitis resembling the neuro-paralytic variety. Irido-choroiditis and œdema of the retina and disc are also met with.

Acuteness of vision may be diminished to $\frac{1}{5}$ or $\frac{1}{10}$, while the field of vision for white remains normal. In one case the

field for green was larger than that for red ; in another there was a central scotoma (the patient was a man employed in a wine tavern).

In the treatment of the disease Dianoux has obtained benefit from the following remedies : Pressure upon the eyes and in some cases blepharoraphy to protect the cornea ; ergot for fifteen days, followed by duboisin for a similar period to the extent of producing a slight toxic effect ; quinine and iron, hydropathy, and the continuous current.

A. Hill Griffith (Manchester). The Field of Vision. *Med. Chron., Nov.*, 1885.

This paper, besides containing an admirable resumé of our knowledge on this subject, includes also a number of interesting clinical cases illustrating defects of the visual fields, and a careful generalisation from fifty-two cases of central colour scotoma. In speaking of the peculiar shape of the nasal half of the field, Dr. Griffith notes that we cannot account for this merely by the face, nose, brow, cheek, &c., preventing the light from reaching the retina. If in tracing the nasal half of the right field, for example, we cause the patient, his macula being still directed to the fixing point, to turn his face strongly to the left, there will be no gain in extent. The facial prominences have, by their presence, caused certain parts of the retina to become functionless from disuse ; this change taking place not in the individual but in the species.

In regard to tobacco amblyopia, we think Dr. Griffith is somewhat sweeping when he asserts that general atrophy of the optic nerve or disc never ensues as the result of tobacco. He will most probably have cause to alter this opinion. We can well remember a case where double optic atrophy occurred unquestionably from tobacco, and where, with disuse of tobacco and assiduous application of the constant current, V. improved to $\frac{20}{20}$. His cases of absolute central scotoma and his account of hemianopic defects are most valuable. Altogether we can most cordially commend the paper for perusal.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, DECEMBER 10TH, 1885.

JONATHAN HUTCHINSON. F.R.S., President, in the Chair.

[Reported by Dawson Williams, M.D.]

Diabetic Retinitis.—Mr. E. Nettleship showed a patient suffering from diabetic retinitis. Scattered over the fundus were many white patches and spots. He thought that they differed in position, mode of arrangement, and colour, from those of albuminuric retinitis; he had noticed this difference in other cases of diabetic retinitis. At the yellow-spot region of the right side was a dense irregular mass of white deposit with no radiate arrangement. The general tint of the spots was, he thought, yellower than in albuminuric retinitis. The patient was a man, aged 50, with cataract on the left side. The appearances had remained unaltered since January, 1885.

Dr. Stephen Mackenzie pointed out that though the majority of early observers had assumed that retinitis in diabetes was due to albuminuria, Leber had shown that retinitis might occur in connection with diabetes independently of albuminuria. He did not think the appearances characteristic; anæmia, cerebral tumour occasionally, and lead-palsy, all produced retinal changes closely resembling those of albuminuric retinitis. In a case reported by Leber, and in another reported by himself, there were hæmorrhages into the vitreous body. He inquired whether the combination of hæmorrhage into the vitreous body with retinitis could be considered characteristic of diabetic retinitis.

Mr. Nettleship agreed that retinitis with hæmorrhages and white patches, combined with hæmorrhage into the vitreous, pointed strongly to diabetes. He was inclined to think that the state seen in the patient was a later stage of the same condition, and that the changes were characteristic of diabetes.

Dr. S. West agreed with Mr. Nettleship and thought that the appearances bore no close resemblance to albuminuric retinitis.

Mr. Adams Frost suggested that the changes in the retina in the patient resembled those seen in albuminuric retinitis in

the late stage, and that they appeared to be unusual, because patients with albuminuric retinitis seldom survived long enough.

Mr. McHardy suggested that diabetes was sometimes overlooked, owing to this resemblance.

Extraction of Chip of Iron by the Electro-magnet.—Mr. Nettleship showed a patient from whose eye a chip of iron had been removed with the electro-magnet. No reaction occurred, but the retina became detached. The eye would probably be useless in spite of the success of the operation.

Retinal Detachment relieved by Scleral Puncture.—Dr. W. A. Brailey again showed the patient exhibited at the last meeting; the retinal detachment had been treated by scleral puncture, and had disappeared.

Essential Shrinking of the Conjunctiva.—Mr. Anderson Critchett and Mr. Juler showed two patients the subjects of essential shrinking of the conjunctiva, the condition described by Mr. Lang at the last meeting as pemphigus of the conjunctiva. A farmer, aged 53, came under Dr. Felix Semon's care in September, 1884, for an affection of the right nostril, which resembled syphilitic perichondritis and periostitis. In June, 1885, he was transferred to Mr. Nettleship on account of epiphora and conjunctivitis, with partial obliteration of the lower *cul-de-sac*. The conjunctiva of the upper lid was marked by scars parallel to the free border. The affection went on from bad to worse in the right eye, and in August, 1885, slight conjunctivitis of the left was noticed. The right finally became almost blind. Both eyelids were thickened, and partly adherent to the globe. The *culs-de-sac* were obliterated; the globe moved pretty freely, but the lids moved with it. The lashes were inverted, and the cornea opaque and vascular. Similar shrinking of the conjunctiva had commenced in the left eye, the lashes turning inwards, and the *culs-de-sac* so much diminished that the lids could hardly be everted. The conjunctiva red and velvety, but no scars. Vision still fairly good. A distinct history of syphilis ten years earlier. No sign of pemphigus on the body, though the man stated that he had seen bullæ on his palate. Mr. Critchett expressed the opinion that the condition had no relation to pemphigus, but was an essential shrinking of the conjunctiva, similar to that described by Gräfe (*Arch. Oph.*, Vol. XXIV.) and Bäumler (*Monatsbl. f. Aug.*, Aug., 1885).

Dr. F. Semon said that the patient came under his care suffering from a muco-purulent discharge from the nose; the only part affected was the left nostril. Mercury and iodide of potassium, separately and in combination, produced no improvement; while under this treatment, several large bullæ appeared, and the skin of the face was in a brawny condition, resembling erysipelas. This subsided after withdrawing the drug. Conjunctivitis afterwards appeared, and small serpiginous ulcerations of the mouth. He had been impressed by the infective character of the malady, and had suggested that it might be a case of very slowly advancing glanders.

Mr. Lang quoted a case recorded by Schweigger, which agreed closely with the patient shown by Mr. Critchett. The disease had been seen at all ages, and in many of the cases there was no suspicion of syphilis.

Mr. Juler was struck by the exceedingly localised nature of the disease in Mr. Lang's cases. In a certain proportion of the cases no pemphigus was observed; while in others, where bullæ were seen, the amount of shrinkage of the conjunctiva was more extensive.

Mr. Nettleship said that, even if the disease were allied to pemphigus, there was a good deal more extensive inflammation than in mere conjunctivitis, for there was great thickening of the lid.

Mr. Malcolm Morris thought that the use of the term pemphigus required justification. Pemphigus was a well-marked disease, probably neurotic, with definite clinical history, while this appeared to be an infective process, probably a late syphilitic lesion. The slow progress, the occurrence of new growth, probably inflammatory, in the skin, seemed to show that the disease was allied to rhinoscleroma.

Compression of Optic Chiasma.—Mr. Silcock showed a sarcomatous tumour, springing from the pituitary fossa, and compressing the optic chiasma, which was elongated and flattened. The patient, a needlewoman, aged 25, was admitted into St. Mary's Hospital, comatose; she had worked up to two days earlier. There had been, so far as could be ascertained, no defect of vision. The optic nerves were inflamed, but not degenerated.

Double Optic Neuritis after a Fall.—Dr. Samuel West.—A girl, aged 11, was admitted into the hospital with the history that, one month before, she had fallen and struck her head, that two days later she had a fit, and subsequently, on several occasions, short attacks of unconsciousness, and that she had gradually grown feebler. There was no paralysis and no objective symptoms beyond double optic neuritis; vision was good, Jäger 1 being read with facility. Under iodide of potassium and mercury, for ten weeks, the neuritis completely disappeared.

Contraction of Field of Vision in Diphtherial Paralysis.—Mr. W. H. Jessop had examined the field in a child suffering from diphtherial paralysis when she first came under treatment, and found considerable contraction; this disappeared as the other symptoms improved.

Mr. Lang had examined one case of diphtherial paralysis and found no limitation of the field. He added that Professor Uhthoff had examined several cases, but had not recorded any limitation.

Neuro-paralytic Ophthalmia.—The Honorary Secretary for Mr. Charles Higgens.—The patient, a woman, aged 19, had a large central corneal ulcer, small superficial ulcers on the skin of the temple and forehead, and total anæsthesia of the conjunctiva, and all parts supplied by the right fifth nerve; wasting of the muscles of mastication occurred later. The eye was brought under the influence of atropine, and carefully covered; the patient was sent to the seaside; the ulcers of the skin healed within six weeks; the corneal ulcer healed in eight months, leaving a dense leucoma; the anæsthesia still persisted, and there was some ulceration of the nostril, and styes on both eyelids; the patient was otherwise in good health, and the eye on the affected side appeared to be, with the exception of the leucoma, quite normal.

Retinitis.—Dr. Brailey showed a girl, aged 12, the subject of congenital syphilis, in whose left eye were numerous white, opaque, striated retinal patches, very similar in appearance to opaque nerve-fibres. Since first seen, she had albuminuria. He regarded these as due to retinitis of renal origin; in addition, there were a few minute spots of choroiditis disseminata. There was long-standing extensive suppuration of the bones of

the left forearm and of both tibiæ; no visceral enlargements could be detected. The case was accompanied by an ophthalmoscopic drawing.

Card Cases.—Mr. W. H. Jessop: (1) Large semi-circular Retinal Hæmorrhage, near the yellow spot; (2) Detachment of Retina (living patient). Mr. Juler: Gumma of Iris (living patient).

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ON BILATERAL ABDUCENS PARALYSIS.

By George A. Berry,

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A certain degree of restriction in the extent to which either eye can be moved outwards when compared with the normal extent of the field of fixation in this direction is often observed in cases of concomitant convergent squint. Schneller,* who has made accurate measurements of the field of fixation under different circumstances, has been led, from the results obtained by such examinations, to distinguish two forms under which this kind of squint may be classified :—

(1.) The *accommodative convergent squint*, in which the boundaries of the field of fixation do not materially differ from the normal boundaries. This form is also characterised by yielding speedily to the correction of the error of refraction on which it mainly depends.

(2.) The *muscular convergent squint*, in which the inner boundaries of the field of fixation exceed the outer to an amount more or less markedly greater than is the case under normal conditions. The correction of any error of refraction existing in this form of squint does not lead to its complete disappearance.

The degree of the squint in cases of the second type corresponds very much to the amount of the excess of the action of the interni over the externi, although the degree may be modified by the co-existence of errors of refraction leading to the addition of

* Graefe's Archiv., XXI., 3, p. 133 ; XXII., 4, p. 177 ; and XXVIII., 2, p. 97.

an accommodative element in the squint. When no other circumstance intervenes, such as amblyopia, a greater degree of hypermetropia, &c., in the other eye, the one in which there is the greatest excess of power of the internus over the externus is the one which takes up the squinting position. Hence one frequently finds that although there is a restriction in the action of both externi, that of the externus of the squinting eye is most marked.

Whatever be the cause of such decided preponderance of power of the interni over the externi, it is of far too frequent occurrence to be ascribed to paresis of both externi ;* besides paralysis of one or both externi is not always at once, or even at all followed by pathological convergence. It appears unlikely, too, from the circumstance that there is a tendency to the disappearance of the squint with age, as well as from the frequent cessation of the abnormal convergence under chloroform, that either Schweigger's view of an elastic preponderance,† or Alfred Graefe's myopathic theory,‡ which ascribes the squint to anatomical changes occurring in the contracted muscle, is sufficient to afford at all events a general explanation of the cause.

No such theories have been brought forward to account for the gradual divergence of a blind eye which one so often sees, an acquired preponderance of the externus over the internus following a condition which, as it deprives the individual of the chief incentive to convergence, often alters the relative functional activity of the two muscles. Does anyone suppose that in such

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* This seems to be suspected by Alfred Graefe. "It is, in fact, these bilateral restrictions of abduction which in such cases point to the probable muscular nature of the squint, whilst at the same time the equality in the corresponding deviations certainly does not negative the supposition of a congenital or early acquired bilateral abducens paresis." (See Graefe—Sæmisch Handbuch, Chap. X., p. 102.)

† Klinische Untersuchungen über das Schielen, Berlin, 1880.

‡ Loc. cit., p. 89.

cases the physical elasticity of the internus has become lessened, or the texture of the externus become more dense and less capable of relaxing?

Most of the cases of muscular convergent strabismus, and probably all of the purely accommodative variety, first make their appearance after the first year or two of life, and generally not much before the third. In the cases of convergent squint which begin much earlier, which either exist at birth or are noticed during the first few months, I have mostly found one of the two following conditions:—

(1.) Very great restriction of the power of abduction in the squinting eye, while in this respect the other eye is normal.

(2.) Marked or complete loss of abduction power in both eyes.

Such cases are of course not cases of true concomitant squint, but of paresis of the sixth nerve on one or both sides. Owing, however, to their occurring at such an early age, and existing frequently for so long before the patient is brought for examination, whilst at the same time there is no diplopia complained of, they are apt to be overlooked and regarded merely as ordinary cases of convergent strabismus. The perfect alternation of the squint when the paresis is double, the right eye fixing everything placed slightly to the left, and the left everything lying to the right, though characteristic of the actual lesion, is of itself apt to mislead when the condition, as in the cases under consideration, is of long standing and not associated with diplopia.

The unilateral type of the cases I allude to is not very uncommon, and must have been observed by most who are specially interested in eye diseases. The paralysis is seldom complete and the cause seems generally to be peripheral. The double paralysis is certainly rare, though perhaps less so than my own observations have led me to believe. I have met with it three times in infants under six months, in all of

which cases it was first observed shortly after birth, and was apparently complete, there being no movement of abduction in either eye, although objects attracting attention were fixed by the opposite eye to both sides. In none was there any evident defect of vision, but I failed to make an ophthalmoscopic examination, and am, therefore, unable to say whether there were any traces of optic neuritis. The following three cases have also come under my observation, which, as the patients were older at the time they presented themselves, admitted of a more complete examination.

Case 1.—Clara Wilson, aged 7 (Dec., 1880), a delicate child, with lateral curvature of the spine; parents first cousins; no history of any cerebral affection; convergent squint since birth; absolutely no power of abduction in either eye; on reading with the right eye, the head is held slightly to the right, and with the left to the left. The left eye is the one most frequently used for fixation. There is no diplopia. $V = \frac{20}{50}$ in either eye, and is not improved by glasses. There is slight horizontal nystagmus, most marked on looking upwards.

Case 2.—Fanny Joss, 12 (Nov., 1885), has squinted since birth; at one time, according to her mother, more than at present. (?) $V = \frac{20}{20}$ in either eye, and Hm. 1·0. For distant objects fixed in the middle line and in the horizontal plane through the eyes there is convergence of the optic axes amounting to about 1.‴ the right eye being usually the one which fixes. But there is a constant habit, when looking at any distance, of throwing the head slightly back, so that the eyes are slightly depressed, and in this position there is no convergence. On looking downwards there is not only no convergence, but very decided divergence along with torsion, especially marked in the left eye. On looking upwards the convergence also disappears. There is no attempt at abduction made with either eye on looking to the sides, so that the squint is markedly alternating, everything lying any distance to the right of the middle line being fixed with the left eye, and vice versâ. There is no diplopia, nor can it be elicited in any way. The fundus is absolutely healthy in both eyes.

There are no other cases of squint in the family, and no history of any infantile cerebral affection or defect of vision. The patient is well nourished and healthy.

Case 3.—Charles Birss, aged 3 (Dec., 1885), a delicate child of slow intellectual development. Sight appears to have been very defective at one time, but is now good as far as can be made out. There are no ophthalmoscopic changes. There is convergent strabismus (rather more than 2‴), which was first noticed about two months after birth, but which the father admits may have existed earlier. There is no diplopia. The power of abduction is completely absent in the right eye, and almost completely in the left as well, the squint being more and more marked to either side and alternating, though the left eye is most frequently used for fixation. There is no squinting in the family. The parents are both healthy. The child was born prematurely.

So far, I have had no opportunity of determining what lesion or lesions give rise to this double paralysis, occurring so early in life. The absence of any symptoms indicating a gross cerebral lesion seems to point to some very limited destruction. Whether this destruction occurs in the central nuclei of the nerves, as in true ophthalmoplegia externa, or somewhere along the pretty intimately connected course of both nerves, can be merely a matter of conjecture. The completeness of the paralysis renders it unlikely that the cause is the same as that producing the more common unilateral paralysis. Post-mortem examinations in cases where a double abducens paralysis has been one of the symptoms of disease, acquired at various periods of life, have generally revealed some gross cerebral changes which do not throw any light on this subject. There is, however, one case recorded by Leber* which is suggestive. In this case the symptoms during life were: severe headaches, vomiting, drowsiness, and occasional unconsciousness; later on, paresis of the right facial

* Graefe's Archiv., XIV., 2, p. 333.

and of both abducentes, optic neuritis, &c. The cause of these symptoms was found on post-mortem examination to be a glio-sarcoma, involving the tuber cinereum, infundibulum, and immediate surroundings. Both lateral ventricles were much distended by a clear fluid. The 6th nerves were considerably thinned *at the points where they pass over the internal carotids in the cavernous sinuses;* above and below these points they were normal. Microscopic examination of these symmetrical thinned portions revealed an almost complete absence of myeline, as well as other interference with the nerve fibres. Leber suggests the following explanation* of the cause of the paralyses of the 6th nerves in this case: "From the absence of changes in other parts of the nerves, those mentioned must be looked upon as the immediate cause of the paralysis, and are sufficient to account for it. The thinning cannot be ascribed to the pressure of an inflammatory exudation or tumour, as these conditions were absent in this situation. On the other hand, it is a question if the increase of intra-cranial pressure would not be sufficient to produce it. We can easily imagine the nerve at the position where it was thinned being exposed to very considerable pressure, owing to interference with the return of the venous blood. We are all the more justified in resorting to this explanation as it is the only one which presents itself, and is besides completely sufficient."

A similar pressure may possibly be the cause of the condition which forms the subject of this communication, and although no ophthalmoscopic symptoms of neuritis existed in the cases I examined, it is, of course, possible that the defective vision in the first and third cases cited was due to neuritis.

I have only met with one case in which complete paralysis of both external recti came on in adult life

* Loc. cit., p. 351.

and remained for some years the only symptom of cerebral disease. The following is a short account of this case :—

James Henderson first consulted me in 1878, on account of diplopia which had existed for some time previously. I found left convergent strabismus with complete loss of abduction to either side, no neuritis, and no other symptoms except a tendency to melancholia. Three years previously, he woke one morning with right hemiplegia and aphasia. The aphasia passed off in a few days and he was not long in recovering from the paralysis as well. Shortly after, I last saw him towards the end of 1882, at which time his condition appeared to me to be exactly the same as before ; he had to be removed to Morningside Asylum, owing to having exhibited symptoms of insanity, which had lately shown a suicidal tendency. He died in the Asylum last July, but unfortunately no post-mortem examination was permitted. While under Dr. Clouston's charge there were gradually developed peculiar automatic movements of different parts of the body, more particularly rapid rythmical movements of the upper parts of the body backwards and forwards, but no further paralytic changes, and the muscular paralysis appears to have remained unaltered till death.

Whilst, then, restrictions in the power of abduction in both eyes are frequently met with in convergent squint pointing not only to the muscular, but also to the truly bilateral nature of the squint, these restrictions cannot be regarded as paralytic. There is, however, a class of cases where the bilateral restrictions are more marked and must be considered paralytic. The lesion producing these, the nature of which is unknown, occurs very early in life, and is, perhaps, more frequently the cause of early convergent squint than is generally supposed.

SEVERE RECURRENT HÆMORRHAGE AFTER EXCISION OF THE EYE, IN A SCORBUTIC SUBJECT.

By E. F. Drake-Brockman, F.R.C.S.,

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Sheik Davood, police constable, a well-made Mahommedan, aged 35 years, was admitted into the Eye Infirmary, Madras, on the 28th May, 1883, in great distress on account of his left eye, the vision of which was totally lost. History: He states that five weeks ago, while placing a number of soda-water bottles on the ground, one slipped from his grasp, and coming into contact with the ground, burst, and a fragment struck him in the left eye. Considerable hæmorrhage followed and continued for some days. Vision was instantly lost.

Present condition: The tension is -3. Crossing the cornea in an oblique direction from below upwards and inwards is the cicatrix of the wound, which encroaches on the ciliary region; the anterior chamber is almost entirely obliterated except at its lower portion, where some blood is to be seen; the iris is adherent to the corneal wound; vision is lost; that of the right eye is good.

June 2nd.—Under chloroform, the left eyeball was enucleated. After his return to bed, severe hæmorrhage from the cavity occurred three times; it was eventually stopped by plugging and the application of ice.

7th.—On the night of the 6th at 11 p.m., I was summoned to the patient, who had lost a considerable amount of blood; cold and the application of iron checked the bleeding.

9th.—Severe hæmorrhage began again at 3 a.m. At 7 a.m. the patient was put on the operating table, and Paquelin's cautery was employed, but failed to arrest the bleeding; the orbital cavity was then plugged firmly with lint soaked in liq. ferri perchloridi fort. A mixture of lead acetate and opium to be administered every third hour.

13th.—The dressings were removed this morning; the orbital cavity was filled with dark clots, sloughy tissue and coagulated blood; the margins of the lids about half an inch in breadth from the inner to the outer canthus are one thick slough which is beginning to separate; the general state is good. The cavity was filled with absorbent cotton pads soaked in boracic acid lotion and a bandage applied. Temp. 99, pulse 75, bounding. The mixture continued.

14th.—This morning, while at stool, active hæmorrhage set in, but was controlled by a strip of lint soaked in iron and applied to the lids. At 4·30 p.m. I found that since the morning the superficial dressings had been removed twice on account of the oozing which had been going on from the deep parts to a considerable extent. All dressings were now removed and firm packing of the cavity with lint soaked in iron was again resorted to; the lower lid came away as a slough. A mixture containing twenty drops of turpentine was ordered every third hour.

15th.—Slight oozing has occurred; the bandages and dressings left undisturbed; skin cool; has taken nourishment well; pulse full and strong; the gums observed to be spongy. To each dose of the mixture three minims of the tincture of aconite were added, and a lime juice drink was ordered.

17th.—Removed the superficial dressings and washed the parts with carbolic acid lotion; did not disturb the deep orbital dressings; since yesterday the turpentine mixture was given three times a day. On account of the evidently scorbutic condition of the patient, a mixture containing liq. ferri perchlor., acid. hydrochlor. dil., and liq. strychniæ was ordered.

24th.—Removed the packing put in on the 15th. The superficial portions came away as mummified masses; no hæmorrhage occurred on removing the dressings; the cavity was packed again with carbolic oil dressings. The mixture was continued.

26th.—All slough was removed by the scissors this morning, and the opposed granulating surfaces brought together by firm strapping.

2nd July.—There has been no recurrence of the hæmorrhage; the patient was discharged from hospital.

Nothing remarkable was noticed during the operation in this case, nor was there anything in the patient's appearance to lead one to infer that troublesome hæmorrhage would follow the removal of the eyeball. The scorbutic dyscrasia was the secret of the whole of the after-trouble. It is unnecessary to add that the repeated and profuse bleedings rendered the patient very anæmic.

H. W. Bradford (Massachusetts). **A Case of Enucleation with Replacement of the Human Globe by that of a Rabbit.** *Boston Med. and Surg. Jour., Sept. 17th,* 1885.

This operation was performed August 9th, in the presence of several medical gentlemen.

The patient was a seaman in good health, and about thirty-five years of age. In consequence of an injury received in early childhood one of his eyes had become much atrophied.

The removal of the stump was conducted in the usual manner, except that a strabismus hook was passed beneath the recti muscles, and a suture inserted previous to their division from the sclerotic; and then the atrophied globe having been drawn forward, a needle was entered through the conjunctiva close to the inner canthus, the nerve found, and the suture inserted as near the centre of its substance as possible. The nerve was now divided close to the sclerotic, the stump was removed, and the resulting hæmorrhage, which was trivial, controlled by ice.

The next stage was the removal of the eye from the rabbit. A circular incision was made in the conjunctiva about 5 mm. from the cornea, the conjunctiva carefully dissected back, and the tendons of the recti and obliqui divided close to their insertion. The eye being now drawn out, the nerve was cut at about 8 mm. from its sclerotic entrance. The cavity of the patient's orbit being by this time perfectly free from blood, a little albumen from a fresh egg was poured into it, and the rabbit's eye also dipped in albumen previous to putting in place. The suture, which had previously been passed through the patient's optic nerve, was drawn forward and inserted into

the optic nerve of the eye, and by means of a peculiar double slip-noose the ends of the nerves were brought into apposition ; one end of the suture was cut short, and the other, which had been passed through the conjunctiva, near the inner canthus, was firmly secured by means of a piece of adhesive plaister to the nose. The object of thus securing it was to prevent its being subjected to any tension, which would have resulted in the removal of the slip-noose. The four recti muscles were next brought into position, and sutured to the sub-conjunctival tissue, and the conjunctiva attached by four sutures to the band of the same tissue which had been left around the cornea.

The lids having been closed, iodoform was dusted over them, and a pad of absorbent cotton and flannel bandage applied.

For seven days the parts were left undisturbed, but the patient was carefully watched for any febrile disturbance. Nothing of such a nature, however, occurred, nor was any offensive odour perceptible. On the seventh day, upon removal of the bandage and pad, nothing of an abnormal character was observed about the lids, except a small amount of mucus gluing the lashes together.

The eye itself was next carefully examined. The cornea presented a slight haziness, but this seemed to be superficial ; the conjunctiva chemosed and over-lapping the cornea in all directions, except externally, where the sclerotic coat was exposed for a space about 8 mm. long, and 6 mm. wide. This condition was found to be due to the premature sloughing of the suture through the external rectus, which had contracted and drawn the conjunctiva with it. The movement of the eye was good in all directions, except that divergence was imperfect. The suture connecting the nerve was withdrawn, as were also those of the superior and internal recti ; but the inferior being still found firmly adherent was allowed to remain. Atropine was dropped into the conjunctival sac, the eye closed, and iodoform and compress used as previously.

On the twelfth day after the operation the eye was again examined, as the patient complained of some annoyance in it, this being the first complaint he had made. It was discovered that the remaining suture attached to the inferior rectus had

sloughed out, and was found under the lower lid, this, no doubt, being the cause of the slight sense of irritation experienced by the patient. The condition of the eye was as follows: cornea hazy, but somewhat less so than when previously examined; conjunctiva well united around the cornea and to the globe; exposed sclerotic on outer side had become covered to about half of its extent: recti muscles working satisfactorily, with some improvement in divergence over that manifested before.

Atropine, iodoform, &c., were used as previously, until the time of writing, eighteen days after the operation, when the condition of the eye was as follows: conformation and tension good: cornea improving, and cleared peripherally so as to allow the iris to be distinctly seen; chemosis of the conjunctiva gone, although the membrane remains congested; exposed sclerotic on outer side of the eye practically covered by the conjunctiva; ocular movements in all directions good.

The object of the operation was partly experimental—an endeavour to ascertain whether the whole organ could be nourished sufficiently long to have a vascular supply established. In this respect a reasonable degree of success was obtained.

Vision was not expected in the transplanted organ in any case, for the optic nerve was composed principally of connective tissue, and diminished to half its normal size. The principal aim was to obtain cosmetic effects.

The value of the operation cannot be estimated from one trial, and it is extremely dubious whether vision could be obtained by the union of the optic nerve. That it may prove of some value in children upon whom enucleation has been performed is credible, for it is well known that in those cases the orbital cavity remains imperfectly developed. It is true that we could not expect a fully-matured rabbit's eye to increase in size, but Dr. Bradford suggests that the substitution of a young dog's eye might obviate the difficulty, as it would, in all probability if well nourished, increase in size as though in its normal position. Cosmetically, it could be used in cases where an artificial eye cannot be adapted on account of some deformity in the conjunctiva or lids.

The albumen was used empirically, as we had found in alloplastic operations that dipping the flap in albumen previous

to adjustment produced excellent effects. Whether it assists in nourishing the transplanted tissue, or is of advantage merely on account of its adhesiveness, has yet to be determined.

HEUSE (Elberfeld). **A Retinal Light-reflex.** *V. Graefe's Archiv. XXX. 1, p. 155.*

The appearance described by the author is seen in the erect image, when the flame of the lamp is situated about 10 cm. above and 20 cm. behind the eye under examination. It consists of a small oval ring of light upon the retina, which may alter its shape as the surface of the retina changes its character. For instance, the ring changes into a heart-shaped figure when it lies over a broader retinal vessel, and it may appear as a broad diffuse streak, or as two very faint rings. Occasionally Heuse has seen the ring replaced by a clear but very pale inverted image of the source of light. The ring is best seen when the observer is very close to the observed eye. It is always within the retinal image of the lamp flame, moves directly with the movements of the observer's head, and makes extremely minute movements when the ophthalmoscope mirror is rotated. The best position for observing it is between the macula and the papilla.

Heuse has never seen the phenomenon in myopic eyes, and it is never well marked in the aged. He considers it to be a reflex from the interior coats of the eyeball, similar to what is seen at the bottom of a basin evenly illuminated, and refers in this connection to the entopic appearance of a retinal reflex, which he described in Graefe's "Archives" in 1872. This latter appearance is produced as follows:—If a candle be moved about in a dark room (as H. Müller proposed for the purpose of observing the shadows of the retinal vessels) somewhat to one side of the eye, the experimenter can perceive a second and inverted image of the flame projected towards the side opposite to that on which the candle is held. This image is formed by a double reflection from the surface of the retina, and moves in the opposite direction to the movements of the candle. Similarly Heuse believes that the objective ring now described by him is produced by a double reflection from the retina, the rays being first reflected from the surface opposite to

the ophthalmoscope towards an anterior portion of the retina, and then reflected back again so as to form a second fainter image in the neighbourhood of the original image.

F. Newall. Internal Reflections in the Eye. *Proceedings of Royal Society, No.* 223, 1883.

This paper describes a phenomenon similar to, if not identical with, the light-reflex observed by Heuse (see above). The author has investigated the matter with much care; his conclusions are at variance with Heuse's.

The phenomenon consists in the perception under certain conditions of a false image, or "ghost," produced by reflection of light within the eye.

To find the ghost, stand opposite a uniformly dark wall in a darkened room; direct the eyes to a point in front (*e.g.*, a mark on the wall, a pin in a curtain); hold up a candle at arm's length, and move it to and fro over about two inches, on a level with the point fixed, and a little to the right or the left of it. The ghost (ghosts, if *both* eyes are used) may be seen moving with a motion opposite to that of the candle on the other side of the point of direct vision.

The best way *to study* the ghost is to set a candle on the table about a foot from the eye, and place on edge, close in front of it, a dark-coloured board two or more feet in length, and of breadth just enough to allow the flame of the candle to be seen above it. Fix the eye on an object moved along the top edge of the board. The board in shadow makes a favourable background for the "ghost," which will be found in the position described below. In either of the methods described, the motion of the candle or of the moving point should be slow, and to and fro over a short range, but it should be continued till the image is found, for if the image rests, it makes less and less impression on the retina. The visibility of the ghost varies with the state of the accommodation, and with differences of refraction, and the conditions under which it is seen best vary accordingly in different persons.

Under the first method the ghost is seen to move in a line drawn through the fixation point and the candle, in a direction opposed to that of the candle's motion, and with a velocity

equal to that of the candle. Under the second method the ghost moves in the same direction as the fixation object, and with double its velocity. Careful inspection of the ghost itself shows it to be an inverted image of the candle, about equal in size, very faint, and of a slightly dull bluish tint. It is independent of the position of the eye-ball in the socket, and hence must be produced by reflexions internal to the eye, and not brought about by its external surroundings.

The mode of its production is probably as follows:—An image of the candle flame is thrown on the retina; this first image becomes a source of light from which rays return along the paths already traversed to the candle whence they started; but part of these returning rays are reflected at the various surfaces bounding the refracting media, and those reflected by the anterior surface of the lens, or more correctly by the posterior surface of the aqueous humour, are brought to a focus somewhere between the lens and the retina. From this focus they do not diverge much before they reach the retina; on the retina they form a blurred inverted image of the first retinal image.

The only difficulty in the way of accepting this solution is that, according to calculation, the light proceeding outwards from the first image on the retina would, after refraction at the posterior surface of the lens, reflexion at the anterior surface, and second refraction at the posterior surface, be focussed at a point in the vitreous humour, when the eye is focussed for long distances, about 2·4 mm. from the posterior surface of the lens, and when the eye is focussed for a near point, about 1 m. from that surface.

On the other hand, there are many points which lend support to the explanation above given. If the positions of the candle and ghost be noted in any one position of the eye, and the candle be moved into the apparent position of the ghost, then the ghost will be observed in the place at first occupied by the candle, that is, the first and second images of the candle on the retina are conjugate foci with respect to some reflecting surface in front of the retina.

The ghost is an inverted image of the candle; therefore, its physical cause, the second retinal image, must be erect, and hence an inverted image of the first retinal image of the candle.

The reflecting surface is therefore concave. The possible reflecting surfaces are the posterior surface of the cornea and the anterior surface of the lens.

A priori the cornea seems least probable for two reasons:—1st. Light from the retina must pass through the lens twice before returning to the retina, and calculation shows that the rays would proceed finally, after leaving the lens, towards the retina, as if coming from a *virtual* focus *within* the lens, 2·39 mm. in front of the posterior surface. 2nd. The light proceeding outwards from the retina and reflected back by the cornea would, in cases when the first image was far from the centre of the field, be reflected on to the anterior surface of the iris, and so would not reach the retina again. No such illumination of the anterior surface of the iris is discoverable.

That the ghost is not due to reflexions within the lens is probable from calculations which show that in any state of accommodation the focus would be virtual and situated in the aqueous humour. That it is not due to reflexions within the aqueous humour is made more probable from the fact that a second ghost, almost certainly due to this cause, is discoverable; it moves in the same direction as the candle, but the faintness and indistinctness of this image are too great to allow of any accurate measurements; it is very blurred, and cannot be brought even approximately to a focus on the retina.

The calculations above referred to were based on the measurements given by Helmholtz for his schematic eye; it may be that individual variations from this standard are such as to bring the focus of the reflected rays further back in the vitreous, and that the different degrees to which the ghost is perceptible to different individuals depend on such variations.

A further interesting observation on the matter was made by the author accidentally, when placed so as to have the setting sun for an object, and a mass of building in shade as a background against which to observe the ghost. In this case the ghost lay below the object. He noticed that the ghost could be brought exactly into the line of direct vision, while the sun still stood at some distance from it, that is to say, that the object and its ghost no longer followed the usual rule of being symmetrically placed with regard to their distance from the fixation point. This appeared to indicate some eccentricity

in the position of the lens of the eye, which, moreover, was different in the two eyes both in direction and amount. On estimating the eccentricity by the entirely different method of Helmholtz the author found a close correspondence in the results.

Seggel (Munich). The Normal Visual Acuity. *Von Graefe's Archiv., XXX., 2, p. 69.*

This paper is based upon an examination of the eyes of recruits, undertaken both with Snellen's test-types and with Burchardt's. The first table contains the results obtained with Snellen's types in 123 intelligent young men, the greatest distance being noted at which each individual could decypher Snellen XX., XXX., and XL. respectively In only one-third of the individuals (in 40 out of 123) was the acuity as tested by the three different types approximately the same, *i.e.*, exhibiting a variation of less than $\frac{1}{20}$; in all the others the acuity varied at the different distances, and in many to a considerable degree. The general result was that the highest V was found for type XX., the lowest for XXX., and an intermediate fraction for XL., the average for XX. being $V = \frac{22\frac{2}{3}}{XX}$, for XXX. $V = \frac{31}{XXX}$, and for XL. $V = \frac{44}{XL}$. Reducing these fractions we find for type XX. $V = \frac{22\frac{2}{3}}{20}$, for XXX. $V = \frac{21\frac{1}{3}}{20}$, for XL. $V = \frac{22}{20}$. Seggel attributes this inconsistency to the peculiar difficulty in decyphering two of the letters in type XXX., "S" and "L," that is to the form and not to the size of the letters.

Burchardt's test-types do not come as well out of the trial as Snellen's. Table II. contains the results of an examination of 107 men with Burchardt's tests. In only one-fourth of the individuals (27 out of 107) is V approximately the same at the different distances, even when so large a fraction as $\frac{2}{XX}$ is neglected. The principal difference is seen in comparing test 2 (to be counted at $25\frac{1}{2}'$) and test 3 (to be counted at $51'$), the latter giving a very low value for V. Taking the average for the three tests used (Burchardt's), and reducing to terms of $\frac{1}{20}$, the results were—for test 1 $V = \frac{27{\cdot}65}{20}$, test 2 $V = \frac{27{\cdot}5}{20}$, and test 3 $V = \frac{24{\cdot}6}{20}$, or a mean value for $V = \frac{27\ (26{\cdot}92)}{20}$.

Comparing the V as tested by Snellen's types XX. with that obtained by Burchardt's, to be counted at $19'$, in these 107 men (who were submitted to both tests), it was found that

Burchardt's test elicited a higher V in 53 cases, a lower in 40, and an equal V in only 14; the average in these two tests being, however, approximately the same. Burchardt $\frac{24·6}{20}$, Snellen $\frac{24·2}{20}$.

Comparing finally the average V. as obtained by Burchardt's 3 tests on the one hand, and Snellen's 3 tests on the other, in the first 43 cases V by Burchardt : V by Snellen :: 26 : 23, in the next 64 cases V (Burchardt) : V (Snellen) :: 27·5 : 24·84, in the whole 107 cases as 27 : 24·2, or in round numbers as 9 : 8.

Seggel concludes that Snellen's types are the better of the two, but that the ordinary method of using them (by placing the patient at 20′ distance, and expressing V by a fraction with that distance as numerator, and the number of the type deciphered as denominator), is not to be depended on, more especially when the letters are German. It is best to ascertain the distance at which No. XX. is read, and then that at which No. XL. is made out, and take the mean between these two values of V as the correct figure. With illiterate persons it is best to use Burchardt's tests, and multiplication of the result by $\frac{8}{9}$ will give the V.

In the matter of illumination, Seggel found that for good vision (V $= \frac{20}{XX}$ and upwards) the acuity on a bright day was to that on a dark day as 30 : 25. This proportion increases with diminishing acuity—so that with V $= \frac{12}{XX}$ it becomes 4 : 3, and with V $= \frac{6}{XX}$ only 3 : 2. But at the same time Seggel found that when the illumination was sufficient to educe normal V stronger light did not in general produce any higher value.

The highest value found by Seggel for V was V $= \frac{35}{XX}$, and this was only found in 8 eyes—of 4 individuals. 16% of all the eyes had V $= \frac{20}{XX}$, a percentage more than double of that found for any other particular value of V. On the whole, V was found higher than 1 in 56%, equal to 1 as above in 16%, and less than 1 in 28%, results strongly contrasting with those found by Cohn in school children, and fully justifying Seggel's conclusion that during school life not alone the refraction but visual acuity itself must deteriorate considerably.

The average V of the 2,253 eyes which had V = 1 or higher was $\frac{24·62}{XX}$, which gives 51″ as the physiological angle necessary for the perception of distinct points, this being the angle subtended by the lines of Snellen's type at the above

distance. Seggel does not propose, in consequence, to publish another series of test-types, but calls attention to the importance of the fact that in youthful eyes at all events V = 1 indicates a distinct deterioration from the physiological normal.

No noteworthy difference was found in the acuity of vision of the right eye as compared with the left; 158 right eyes and 146 left eyes had a better vision than their fellow eyes.

The influence of education upon refraction is brought out by comparing the eyes of the soldiers and non-commissioned officers of little or merely elementary schooling with those of the volunteers, or Freiwilligen, who, in consequence of attaining a certain educational standard, are required to give only one year's compulsory military service. In the first group of 3,052 eyes E was present in 46·7%, H in 40·6%, M in 11·4%, and As or disease in 1·3%. In the second group of 568 eyes E was present in 22·5%, H in 12·5%, M in 60%, and As or disease in 5%.

Table VII. gives an answer to the question what is the average V of the emmetropic eye, the hypermetropic eye, and the myopic eye respectively; and what is the average V associated with each definite degree of ametropia (4,850 eyes—1,553 E, 1,678 H, and 1,619 M). The principal facts are the following:—

In E the average V = 1·1.

In H up to 0·75 D, V = 1 or higher. In H 1 to 1·75 D, V = 0·563. In H 2 to 2·75 D, V = 0·53. In H 3 to 3·75 D, V = 0·42. In H 4 to 5·75 D, V = 0·36. In H 6 to 11 D, V = 0·35.

In M 0·25 D, V = 1·1. In M 0·5 to 0·75 D, V = 0·92. In M 1 to 1·75 D, V = 0·80. In M 2 to 4·75 D, V = 0·73 up to 0·77. In M 5 to 5·75 D, V = 0·65. In M 6 to 10 D, V = 0·53 up to 0·59. In M 10 to 13 D, V = 0·40. In M 14 to 20 D, V = 0·13.

The paper contains further elaborate tables exhibiting the refraction found among the different social classes, as rustics, artisans, educated persons, the percentage of myopia being found to increase with the culture of the class, and the absence of open-air life.

Edward G. Loring (New York). Text Book of Ophthalmoscopy. Part I. *D. Appleton and Co., New York*, 1886.

This first part of Dr. Loring's Text Book is a large octavo volume of 260 pages, divided into six chapters and an appendix, which deal successively with the general principles of the ophthalmoscope; the modes of using the instrument; the anatomy of the fundus of the normal eye; the ophthalmoscopic appearances of the normal fundus; the determination of refraction by various methods; the examination of the media, and the various morbid changes met with; and, in the appendix, physiological optics so far as a knowledge of the subject is necessary for the purposes of ophthalmoscopy; together with a description of various ophthalmoscopes and instruments used in conjunction with them.

The book is freely illustrated with woodcuts, some original, others borrowed from the Graefe's Saemisch Handbook, and other sources. There are also fourteen excellent chromo-lithographs, representing various conditions of the fundus, several of them being reproduced from the atlases of Liebreich and Jaeger.

It is unnecessary to describe the work in detail. As a text book, it deals, of course, chiefly with well-established facts, and these are described in a clear and interesting manner, the author's style inclining rather towards redundancy than towards compression. We note, as particularly good, the sixty pages in which are described and figured the many varying appearances of the fundus which should be recognised as normal, or which, depending on congenital conditions, must be distinguished from the signs of active disease.

We notice with surprise that, while speaking of the use of atropine for ophthalmoscopic purposes, the author says:—"In the minds of some of the profession a belief exists that the use of atropine has a tendency to bring on an acute attack of glaucoma in eyes which are predisposed that way." Does he himself doubt it? Also, that he makes no mention of the special value of homatropine for the purpose named. We are still more astonished to read Dr. Loring's opinion of retinoscopy. He says:—"It still remains, however, in my opinion, the most difficult and least satisfactory of any of the

methods of determining the refraction of an eye, and contributes nothing which cannot be more easily and more expeditiously performed by the upright image." Our own opinion is, that retinoscopy has greatly increased the ease with which this branch of our work is done, and is one of the most valuable additions made to our methods since the introduction of the ophthalmoscope.

One of the most valuable chapters in the book is the one which describes the various kinds of opacity in the lens and vitreous, and shows how their nature and positions are to be determined.

L. Manche (Malta). Ophthalmology in Synoptical Tables, a guide for practitioners and students.

The arrangement of this work is different from that generally met with, and the novelty of the method possesses distinct advantages. It is arranged in a series of nineteen "tablets." Two are devoted to ocular anatomy, one to physiology, and one to semiology; others follow on diseases of the orbit, of the lids, deformities of the lids, and diseases of the lachrymal apparatus. To each of these a separate "tablet" is devoted. The next one, comprising diseases of the conjunctiva, will serve our purpose in giving an outline of the general arrangement of the plates. It displays at a glance the various affections of the conjunctiva and what is to be said concerning them.

The author classifies the various diseases, etc., into (1) injuries, (2) inflammations, (3) effusions, (4) derangements of nutrition, among which he includes pterygrium, xerosis, and tumours. The succeeding columns in the tablet are devoted respectively to causes, symptoms and diagnosis, and treatment. Inflammations are again sub-divided into acute and chronic, and so on. There are also sub-divisions under the other primary heads of classification. Thus, if any disease be selected, it is an easy matter to read across the page, and in the different columns learn the causes, symptoms, the points essential to a proper diagnosis, and the treatment.

The remaining ten plates have a similar arrangement, and are devoted to diseases of the cornea, of the lenticular system (two), diseases of, and operations on, the iris; choroid; ciliary

body and glaucoma; optic nerve and retina; amblyopia and amaurosis; muscular apparatus, and the concluding one on refraction and accommodation. We have said enough to indicate the arrangement of this work. The advantages of the tabular method are evident, the work throughout being done with the greatest care. We believe the author contemplates an English translation, and if this intention be executed, students and practitioners alike will find the work a very useful one.

EDWARD JACKSON (Philadelphia). A Dioptric Scale of Focal Lengths. *Medical News, June 27th*, 1885.

In measuring the power of accommodation, when the distance from the eye to its near point has been determined in centimetres or inches, a problem in arithmetic must be solved before one can express in dioptrics the amount of accommodative power. Again, if the distance from a myopic eye to its far point be measured on any ordinary scale, the same problem is to be met before the number of dioptrics of myopia can be known.

This is the chief disadvantage of the metric system for numbering lenses and recording states of refraction. The number of dioptrics expressing the degree of refractive power stands in no such simple relation to the divisions on the common metre measure as does the expression of the refractive power in inches to the divisions on the yard-stick. Thus, in inches, the expression one-sixth is instantly deducible from the six inches marked on the yard-stick. But the 6 D. lens has no corresponding mark on the ordinary metre measure indicating its focal distance, one sixth of a metre.

This defect of the metric system can be remedied by using a scale divided, not into equal parts, as centi-metres or inches, but so as to indicate the focal lengths of the different lenses of the dioptric system. Thus, starting from zero, a mark at one-fiftieth of a metre indicates the focal distance of the 50 D. lens; at one-thirtieth of a metre, that of the 30 D. lens; at four-fifths of a metre, the five-fourth or 1.25 D. lens, and so throughout.

This scale does away with the necessity for calculating the number of dioptrics that a given focal distance represents; and

these calculations, though singly brief and easy, have in practice to be made so frequently as to demand a considerable aggregate of labour. At the writer's suggestion, Messrs. J. W. Queen and Co., of Philadelphia, have placed it upon the edge of the metre-inch measures they furnish for the measurement of accommodation, etc.

R. Ancke (Berlin). Three Cases of Congenital Ectropium of the Uvea. *Centralbl., f. Prakt, Augenheilk, Oct., 1885, p. 311.*

The writer reports three cases of a rare congenital malformation of the iris met with during the course of six months in Professor Hirschberg's clinic. In each case the defect came under notice accidentally, asthenopia being the only cause of complaint in two of the cases, keratitis of one eye in the third.

Under examination with the ophthalmoscope the pupil presents a notched border which gives it the appearance of a small cog-wheel. Focal illumination shows this to be due to a number of rounded excrescences projecting inwards from the margin of the pupil, and in some places bending round on to the anterior surface. The excrescences are dark brown and velvet-like in appearance, and are in fact an exaggeration of the pigmented line visible at the margin of the normal pupil. They are present in both eyes and are best marked at the upper and lower margins of the pupil. They may easily be mistaken for points of posterior synechia unless examined with care, but are readily distinguished from the latter by the focal method ; the pupil is free and active.

The name papilloma of the iris which has been applied to this condition (Colsmann, Klin. Monatsbl. f. Augenheilk, 1869, p. 53) is misleading, inasmuch as it suggests a neoplasm, whereas it is certainly a congenital malformation. Congenital ectropium of the uvea defines it correctly. A very similar formation is proper to the eye of the horse, occupying the upper and lower parts of the circle, as in the cases hitherto met with in man. It is also frequently to be seen in the cow. The excrescences belong exclusively to the posterior layer of the iris.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, JANUARY 28TH, 1886.

HENRY POWER, F.R.C.S., Vice-President, in the Chair.

Reported by DAWSON WILLIAMS, M.D.

Polarisation Ophthalmoscope.—Dr. Thomas Reid showed a polarisation ophthalmoscope designed to detect colour-defects in the spectrum, and their exact position; a similar instrument could be arranged to determine the position of the neutral point or points in dichroic vision.

He also showed a perimeter acting on a new principle. The fixation-object is a point of light. Immediately in front of the eye is a prism, by the rotation of which the rays entering the eye can be deflected to any desired degree, so that the fixation-object appears to travel around the eye as a centre. By the interposition of variously coloured glasses the field can be mapped for colours.

Also an ophthalmoscope adapted for use with the electric light, and provided with a grating by which the condition of the superficial layers of the retina as to transparency could be ascertained.

Ophthalmoscope with Electric Light.—Mr. Juler showed his ophthalmoscope for the electric light. A concave mirror of short focal length, with a small Swan light, are the essential characteristics of the ophthalmoscope.

Mr. Brudenell Carter thought that the light from this instrument was more pleasant to the patient than the ordinary gaslight.

Amblyopia from Bisulphide of Carbon.—Mr. Marcus Gunn. The patient had suffered in the process of extracting oil from cocoanut fibre. Though he had worked for twenty years at this occupation, he did not experience any ill effects until he began to work in a badly-ventilated room, when the symptoms appeared within four months. His vision was reduced to J. 19, and there was red-green blindness. The general symptoms were well marked; no improvement had occurred under treatment.

Synchisis Scintillans.—Mr. Richardson Cross showed the patient, a woman, aged 73. The glistening particles could be seen by direct examination with lenses from 0 to 20 D, and were distributed with almost perfect uniformity through the vitreous; they shifted very slowly with the movements of the eye, and each held a definite position in the vitreous. He urged that this case, and many others of this disease, showed that the condition did not depend on alteration in the ciliary body or choroid, and that it ought not to be grouped with fluid vitreous and ordinary synchisis. The true pathology of the condition was probably a primary atheroma of the cellular elements of the vitreous.

Essential Shrinking of the Conjunctiva.—Dr. W. A. Brailey showed a patient with shrinking of the conjunctival sac, probably due to old granular lids, and identical with the condition described as pemphigus of the conjunctiva. The appearances in this case were consistent with those of chronic granular lids, although it was true that in granular lids there was usually no such shrinking of the sac. There was no history of pemphigus.

Mr. Lang showed another case of essential shrinking of the conjunctiva, the third which had recently occurred in his practice. There was no evidence of granular lids, or of pemphigus of the body or mucous membranes. One eye was quite blind; with the other, only large objects could be seen.

Mr. Brundenell Carter said that, in the case which had been under his care, there had been no pemphigus, but a prolonged chronic conjunctivitis. He had transplated a piece of conjunctiva from the rabbit with temporary success, but it eventually underwent the same process of degeneration as the original conjunctiva.

Atrophy of Iris.—Mr. G. L. Johnson showed drawings of a case of atrophy of the iris after injury. Eighteen years ago the patient was struck by a wheel on the right eye, which was excised. Two years ago the sight of the remaining eye began to fail, and his friends noticed that the pupil grew larger. During the last seven months, Mr. Johnson had noticed a progressive atrophy of the iris, until at the present time only a small band of iris remained above and below. Vision was very imperfect, and could not be improved by any combination

of lenses beyond J, 5 and $\frac{20}{50}$. The optic disc and macula were unaffected, and the fundus immediately around was healthy; but elsewhere there was general atrophy of the choroid.

Meningitis after Excision of the Eyeball.—Mr. E. Nettleship read a paper, based on the case (at the Moorfields Hospital, in July, 1885) of a young man who was operated upon unsuccessfully, for dislocation of the lens into the anterior chamber. The eye was excised in a state of early, but violent, suppurative inflammation, seventy-two hours after the attempted removal of the lens. The orbit was irrigated with a very weak solution of biniodide of mercury. The man became restless and excitable, with high temperature, within forty-eight hours, and died seventy-five hours after the excision. He was attended by Dr. Stephen Mackenzie. Purulent meningitis was found at the base, and between the cerebrum and cerebellum; there were no tubercles. It was remarkable that well-marked tough thickening of the pia mater, and firm adhesion of the opposite edges of the longitudinal and Sylvian fissures, were found, undoubtedly indicating a previous attack of general meningitis, but the early history of the patient was almost negative. Mr. Nettleship had tabulated all the other published cases of meningitis after excision of the eye, twenty-nine in number. No cases were included in which it was known that the operation was complicated by injury or disease of the walls of the orbit. Of the thirty cases, twenty-six were fatal, and eighteen of these were examined after death, and meningitis found in all; the remaining four cases recovered, usually after a long and severe illness. In a considerable majority the meningitic symptoms set in within forty-eight hours of the enucleation, but the duration of the illness, when fatal, varied more than the period of onset. Except that the meningitis usually affected the base, and was sometimes more marked towards the front, and on the side of the excised eye, and that twice there was thrombosis of the cavernous sinus, there was very little microscopical evidence of transmission from the orbit; but microscopical examination, in four cases, showed inflammation in or around the optic nerve, and in one, inflammation and micro-organisms in the sixth nerve. He suggested that, in spite of the rarity of visible thrombosis, the veins may in some cases be the carriers, and

that (owing to the numerous anastomoses) the blood-current in the cerebral veins may sometimes be reversed, allowing septic material to pass from the orbit upwards to the brain, instead of into the jugular vein. In some cases only the convexity was affected, and in others the disease was more marked on the side opposite to the excision. In a considerable majority, the excised eye had been wounded; but the author dissents from von Gräefe's statement (1863) that the risk of meningitis is much greater if the eye were suppurating when excised, since it appears that in exactly half of the cases no visible suppuration was going on, or had occurred, in the lost eye. The disease is probably due to infection of the orbital wound, either by the decomposition of discharge pent up by tight bandaging, or (as was probable in two cases) by erysipelas. Complications were present in a few cases. Mr. Nettleship believed that, with care, the cases might be rendered even much more rare than they had hitherto been, especially by providing free drainage from the orbit when there was much inflammatory swelling. He at present preferred excision, with suitable precautions, in all cases, to evisceration, as it had not yet been proved that the latter operation might not cause sympathetic disease. Only four cases of meningitis following other operations upon the eyeball were known, and in only one was a post-mortem examination made. In certain cases of meningitis after excision, sympathethic inflammation had set in some time before the meningitis, a fact which seemed to militate against the theory that sympathetic disease passed from the exciting to the sympathising eye by the meningeal coverings of the optic nerve.

Mr. Henry Power had met with but one case of meningitis after excision during suppuration; after the eye had been excised, the orbit was cleared out; and as there was sharp hæmorrhage, the orbit was filled up with layers of lint soaked in chloride of zinc. The patient died of meningitis on the following day.

Mr. Brudenell Carter said that he had always felt himself bound by von Gräefe's dictum not to enucleate an eye in a condition of acute inflammation. Referring to the weak solution of biniodide of mercury used by Mr. Nettleship, he said that, retaining a little of his early knowledge of chemistry,

he had been curious enough to experiment on the prescription recommended by M. Panas (*see* British Medical Journal, January 30th, 1886, p. 225). He had had the supposed solution skilfully prepared, and then skilfully analysed. It appeared to consist of distilled water, containing a trace of alcohol, and nothing more. (*Vide* foot-note, p. 62.)

Mr. Higgens thought the frequency with which suppuration of the eyeball was an antecedent of meningitis seemed to show that suppuration played some part in the causation. He had never once excised a suppurating eyeball, and was strongly of opinion that it was an unsafe thing to do. He preferred to incise the eye and wait.

Mr. Priestley Smith said that two of the cases tabulated by Mr. Nettleship were his. The one patient died; the other, after critical danger with very high temperature and prolonged symptoms of meningitis, recovered. He had been much impressed by seeing the immediate improvement which followed removal of the bandages and cleansing of the wound by syringing into it a warm solution of permanganate of potash. This had undoubtedly saved the patient's life.* If it is safe to excise an eye in a condition of panophthalmitis, it is certainly advantageous to do so, because pain is saved and recovery quickened. If two precautions were observed, he believed that excision might be performed with safety. These were, firstly, to introduce iodoform into the wound, at the end of the operation; and, secondly, to take the temperature night and morning for two days, and if it rose considerably to at once remove all bandages, and thoroughly syringe out the orbit with a bland antiseptic solution.

Dr. P. H. Mules said that the general rule in Manchester was not to excise a suppurating globe; in the only case in which he had excised such an eye, the patient died of meningitis. He urged the advantages of evisceration in the treatment of these cases.

Mr. Lawford read a case for Mr. Tay. The patient, a boy aged nine, receive a small wound in the selerotic; iritis, with pain and vomiting, occurred ten days later; on the following day changes in the vitreous were seen. The eye was excised on the thirteenth day, suppuration having commenced. Next day the

* *Vide* O. R., vol. IV., p 36.

temperature was 103·8 and the patient was delirious; he died on the fourth day after the operation. At the necropsy extensive meningitis, involving the upper surfaces of both hemispheres, the interpeduncular space and both surfaces of the cerebellum, were found. There were no signs of old standing or tubercular disease. The right side was not more affected than the left; the tissues of the orbit showed no special changes, and there was no evidence of extension of inflammation from it. The microscopical examination showed no signs of disease in either optic nerve.

Mr. R. Marcus Gunn felt incredulous as to the existence of any special danger of meningitis, as he had seen fully six hundred cases of excision, under such conditions, where no antiseptics were used, without any cases of meningitis.

Mr. McHardy mentioned the case of a man, aged 46, who insisted upon leaving the Hospital on the next day after undergoing excision of one eye, in order that he might go to the "Derby;" he died two days later of suppurative meningitis. Also the case of a man, aged 24, who, while suffering from religious mania, tore out with his thumb one of his eyes which was quite healthy. Four days later he died of acute suppurative meningitis. The optic nerve had been torn through close to the chiasma. The speaker was in the habit of excising the eye in presence of panophthalmitis, and could remember no mishap. In a woman of more than 80 years of age he had seen death occur after the eye had been freely incised on account of suppuration after iridectomy.

Mr. W. H. Jessop said that Mr. Vernon, who had at one time practised evisceration, had abandoned the operation on account of sloughing of the sclerotic.

Mr. Mules said that von Gräefe, of Hallé, had eviscerated suppurating eyes in fifty instances without any mishap; he had himself had one case of sloughing of the sclerotic, but since he had used perchloride of mercury solution he had had no accident.

Mr. John Tweedy had never seen any mishap after excision which could be attributed to the operation. He had always looked upon suppuration of the globe as an indication for

excision. He was in the habit of washing the conjunctiva before operating, and the orbit, after excision, with a solution of chloride of zinc (ten grains to the ounce).

Mr. Nettleship, in reply, said that the discussion had surprised him, by showing the diversity of opinion on this point which prevailed even in London. He failed to feel the force of the argument advanced by Mr. Higgens, and with regard to the point raised by Mr. B. Carter, as to antiseptic solution used, he would make enquiries.*

Optometer.—Dr. C. E. Fitzgerald showed an instrument for rapidly estimating errors of refraction, which had been made for him by Mr. Prescot, optician, of Dublin. A set of spherical lenses and of cylindrical lenses were adjusted in two frames, which could be moved up and down in a curved frame, somewhat resembling the arm of a perimeter. The cylindrical lenses could be rotated each on its own axis.

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NOTE ON A SIMPLE DIAGRAMMATIC METHOD OF EXPRESSING THE NATURE OF THE DIPLOPIA IN PARALYSIS OF THE SUPERIOR AND INFERIOR RECTI AND OBLIQUE MUSCLES.

By L. Werner, M.B.,

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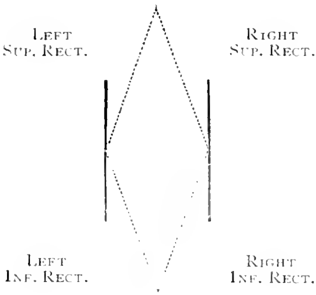
In order to find the variety of diplopia which results from paralysis of any one of the above-mentioned muscles it is necessary, in the first place, to have clearly before one's mind the different actions of the muscle under consideration, and then from the defects in the corresponding movements of the eyeball to deduce the character of the diplopia. This is a comparatively easy task, if performed at one's leisure, when there is ample time for thought ; but in actual practice, especially in a dispensary, where time is limited and there is little room for deliberation, it often becomes troublesome and not unfrequently ends in confusion. I therefore attempted to devise some means by which I could immediately, and without any elaborate process of reasoning, call to mind the variety of diplopia corresponding to paralysis of any one of these muscles, or from the diplopia recognise the nature of the paralysis.

Having separately worked out the question for each of the eight muscles, in the usual manner, and compared the results obtained, I succeeded in reducing them to the two following diagrams, one for the four obliques, and the other for the four recti (superior and inferior of each eye).

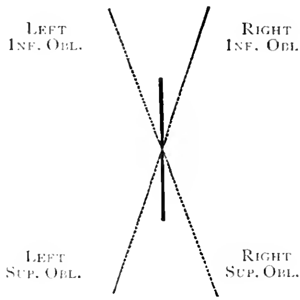
The form of diplopia which characterises paralysis of each one of these muscles is expressed by the position of the dotted line bearing the name of the muscle. The dotted lines represent the "false images," the continuous lines the "true images."

FIG. 1.



RECTI.

FIG. 2.



OBLIQUI.

In the case of the recti (Fig 1) the false images enclose a lozenge-shaped space situated between the true ones, whereas in the case of the oblique muscles (Fig. 2), the true images, which, for the sake of simplicity, I have combined in one line, lie between the four "false images," which diverge from one another so as to form an X. It will also be noted that the dotted lines extend upwards and downwards beyond the others, indicating respectively that the "false images" are higher or lower than the true ones. Another fact which the diagrams indicate is that in the case of the muscles represented in the upper halves of the figures, the diplopia occurs in the *upper* part of the field of fixation, or in other words, in upward movements of the eyes. A similar rule holds good with regard to the lower halves.

The method of using the diagrams will be better understood by taking a particular muscle as an example. Suppose, for instance, that we wish to know what kind of diplopia results from paralysis of the *left inferior* rectus ; it is simply necessary to look at the *left inferior*

portion of Fig. 1 (recti), which gives the diplopia. If we analyse this we find: (1) That the diplopia is "*crossed*," for the false image corresponding to the *left* eye is to the *right* of the true image, *i.e.*, the right image corresponds to the left eye; (2) That the false image has its *upper end inclined towards the true one*; (3) That the false image is *lower* than the true one, for the dotted line extends *lower* than the other one; (4) That the diplopia occurs in *downward movements* of the eyes, for it is in the *lower* half of the diagram that the false image lies.

The same method applies to the other recti: the diplopia for the *right upper* rectus is found in the *right upper* quadrant, and so on for the rest.

The same rules also apply to the obliques (Fig. 2), with one difference. The recti move the eye in the direction indicated by their names, the superior moving it upwards and the inferior downwards, but in the case of the obliques the reverse takes place, the superior oblique moving the eye downwards and the inferior upwards. Therefore for the *superior* obliques we must look at the *lower* half of Fig. 2, and for the *inferior* at the *upper* part.

This is an extremely simple method, although the description of it takes some time. By bearing the figures in mind, it is possible to tell immediately what kind of diplopia would result from paralysis of any one of these muscles, and conversely, given the diplopia, to determine to which muscle it is due.

NOTE ON A CASE OF STRABISMUS DIVERGENS WITH HOMONYMOUS DIPLOPIA.

By George A. Berry,

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It is not an uncommon thing to find that the angular separation of the double images in a case of diplopia does not correspond in extent to the degree of deviation

of the visual axes from the normal position which they should occupy when brought to bear upon any external object.

A study of such cases of so-called anomalous projection of retinal images has necessarily led to a modification in the theory, at one time prevalent, of the identity of the two retinæ. The main argument in that theory was that for every point in the one retina there was one in that of the other eye, the impression on which was, owing to inherent properties of the visual apparatus, referred to the same point in space, and to such points the name of corresponding points was given. It was further held that corresponding points were equidistant in a similar direction from the centre of each retina. What is apparently the case is that there is a constant angular deviation between the lines of projection of images falling on the centre and on points equidistant from the centre of each retina. Whenever, therefore, simultaneous images on both foveæ are referred to the same spatial points, all other retinal points equidistant from the foveæ and similarly directed with respect to them are, approximately at any rate, corresponding points. This arrangement of what may properly enough be called corresponding points is indeed the normal state of matters, and were it not for the occasional exceptions met with under more or less pathological conditions, there would be no reason for preferring the projection or any other empiristic theory to the nativistic theory of the identity of the two retinæ.

Whether each visual axis is directed towards the same or different points in space, it is the rule then that the two central images, and with them images on either eye equidistant from and similarly situated with respect to the central ones, are projected so as to overlap and produce respectively but one visual impression. The combining of two similar images stereoscopically and the overcoming of prisms in front of one eye are familiar

examples of this tendency to the overlapping of the two central images even under abnormal circumstances. In cases of squint, too, the object whose image falls on the fovea of the squinting eye is occasionally seen to lie over and partly, as it were, veil that which is fixed by the properly directed eye. Where, as so frequently happens, there is partial or complete suppression of the images on the misdirected eye, this is not observed. But also in cases where such suppression does not take place, it is much more frequently the doubling of the image fixed, and on which attention is directed, that the patient is conscious of, than the projection on the same spot of the two dissimilar images occupying the fovea of each eye. It is, nevertheless, owing to this overlapping of the central image, even when one eye is misdirected, that the separation of the double images in cases of strabismus with diplopia so often corresponds in extent to the degree of deviation of the visual axes. Again, it is owing to the non-compliance with this normal law of projection of the central impression on the misdirected eye that we occasionally meet with a want of correspondence between the angular distance separating the double images and that separating the visual axes.

Everyone who is in the habit of carefully examining the effect produced by operations on the muscles of the eye must have frequently observed that, as for instance in a certain number of cases of concomitant convergent strabismus, whilst no diplopia exists, or can be elicited by holding a coloured glass in front of one eye, before operation, there is diplopia of which the patient is more or less conscious after operation. In such cases it is often found that the diplopia does not correspond to the position of the eyes after operation, being, for instance, often crossed when there still remains some degree of convergence of the axes. A more thorough examination shows that the position of the double images sometimes corresponds to the difference between the extent of deviation of the axes before and after operation,

whilst sometimes the separation is not so great as the change in the degree of deviation produced by the operation should have effected. In the first case it is evident that the eye has accommodated itself, as it were, to the abnormal position existing before operation, and learnt to project its images in accordance with that position; so that, as the line of projection of its central image corresponds in direction with the visual axis, the projection of its peripheral image of the object fixed by the other eye is directed so as to effect an overlapping of the images in the two eyes, and there is, therefore, no diplopia. Tenotomy of the internal rectus in such a case produces a relative divergence, which is consequently associated with crossed diplopia. In these cases, then, although there is probably always some suppression as well, the absence of diplopia is due in great measure to the acquired faulty projection. In the cases where the diplopia neither corresponds to the actual position after operation, nor to the change effected by the operation, we must infer that there has existed previously an anomalous projection of the retinal impressions of the misdirected eye, but yet not one which corresponded completely to its position. In these cases the suppression is more complete, and the diplopia after operation not, so far as I have observed, complained of spontaneously, and indeed more or less difficult to elicit.

It is unnecessary to do more than refer here to the beautiful examples of incongruity between the distances apart of the double images and the relative positions of the visual axes met with in cases of paresis of the ocular muscles, and depending on the faulty projection of retinal impressions produced by altered conditions of innervation. I have ventured to publish the following case, as it is an excellent illustration of anomalous projection, in a form, too, which, although not likely to have escaped previous observation, is, so far as I am aware, not recorded in works on the subject of strabismus or diplopia.

William Trueman, aged 30, had, when admitted into hospital in the beginning of February, divergent strabismus, which had existed for many years. The right eye diverged $V = \frac{20}{50}$ in both eyes. In the left it was improved to $\frac{20}{30}$ with $+ 1 \cdot 50$ cyl. The right eye was not improved by any glass. There were no abnormal ophthalmoscopic appearances. He complained of double vision, which had come on nine months previously at a time when he was greatly prostrated by starvation and which had persisted since. On examination, notwithstanding a divergence of about $3'''$, the double images at a distance of $4'$ from the eyes were close together, not much more than $1''$ apart, and homonymous. I performed tenotomy of the right external rectus and advanced the internal rectus (Schweigger's operation). The result, a fortnight afterwards, was almost complete parallelism for distant fixation with good abduction power, certainly no marked insufficiency of the externus, and considerably increased power of adduction. The diplopia was still marked, and the double images much further apart than before operation (about $10''$ at $4'$), and homonymous.

The only possible cause of the sudden occurrence of the homonymous diplopia in this case, notwithstanding the long existence of the divergence, could be the supervention of a paresis of the sixth nerve, not improbably caused by exposure to cold and starvation. The fact, however, of the diplopia being homonymous shows that the projection up to the time of the paresis was anomalous in the manner already referred to, *i.e.*, was in accordance with the position of the eye and not with the normal conditions, so that the relative convergence which the paresis produced in the direction of action of the external rectus gave rise to the same effect as an absolute convergence would have done had the original position of the visual axes been parallelism. The long continuance of the diplopia, in spite of the short distance separating the double images, and the apparent disappearance of the paresis, points on the one hand to an alteration in the tone of the external rectus, and on the other to an absence of any power of fusion

of double images. The absence of the power of fusion which, in the case of paresis occurring under otherwise normal conditions of the muscles, would indicate, as was pointed out by v. Græfe, a central lesion as the cause of the paresis, was sufficiently accounted for by the eccentricity of the image falling on the right eye. The more pronounced homonymous displacement of the double images after operation was evidently due to the persistance of the previous conditions of projection. The eye, although having a different position of equilibrium, continued to project its retinal images as if it stood in the previous position, the knowledge of which it had, so to speak, acquired, just as more frequently a deviating eye continues to project in a manner as if it were properly directed

NYCTALOPIA (RETINITIS PIGMENTOSA) OCCURRING IN SEVERAL MEMBERS OF ONE FAMILY.

By Simeon Snell,

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Benjamin C., aged 18, was brought by his mother in the summer of 1885 to consult me on account of impairment of sight. I found that he was the subject of retinitis pigmentosa, and that he suffered from nyctalopia. Pigment, in dots, was scattered round the periphery of the fundus ; the optic disc was less rosy than normal, with -4 D, $V = \frac{20}{50}$ in each eye, and no combination of glasses improved further. The field, mapped by a Priestley Smith's perimeter, showed concentric narrowing.

Inquiries were made as to other members of the family, and the interesting fact was ascertained that several brothers suffered in like manner to our patient. I was enabled to examine the whole family except one member, who was absent from home.

The father, aged 56, had been accustomed to drive home into the country at night for thirty years, and had never suffered any visual inconveniences. He would not trust his sons to drive him after dusk. In each eye the fundus was normal; hypermetropia + 4 D, V = $\frac{20}{30}$ in each.

The mother was myopic, but free from nyctalopia, and there was no abnormal pigment in her retinæ.

The parents were not related before marriage; nor was a history of any previous intermarriages obtained. Careful inquiry could not discover evidence, on either parents' side, of night blindness in their projenitors.

The only daughter, aged 27, was myopic. − 5 D, V = $\frac{20}{50}$; no retinal pigmentary deposit; nyctalopia not complained of.

The following sons were examined:—1. Richard, aged 25, had always seen badly at night, but especially so since he was grown up. The retina at the periphery was studded with pigment; the dots were more numerous and came nearer to the papilla than in the other cases. The margins of the papilla appeared a little blurred. Refraction myopic; this being corrected V = $\frac{20}{30}$. 2. G., aged 24, nyctalopia; pigment deposits well marked; light choroid; fair hair. R V = $\frac{20}{50}$, slightly improved by + glasses; L V = $\frac{20}{70}$, improved by + glasses; at inner part of lens an opacity from old injury. 3. B., our patient, aged 18. 4. John, aged 17, had seen badly at night for four years; small pigment dots at periphery; high degree of myopia and astigmatism not worked out. 5. William, aged 14, had always seen badly at night; pigment dots towards periphery; choroid light; V = $\frac{20}{50}$; astigmatism, not worked out. 6. Ernest, aged 13; no complaint of nyctalopia; no pigment in retina, but it is a little mottled-looking at periphery (is this a pre-pigmentation stage?); V = $\frac{20}{20}$; hypermetropic.

One son, between those aged 24 and 18, is said to suffer in a similar manner to his brothers. He was absent from home, and was not examined by me.

The amount of pigmentary deposit in the foregoing cases appeared to bear a relation to the age of each. It is noteworthy that the youngest should be the only one free from the disease. It will be interesting to observe, if opportunity occur, his future progress.

In all the brothers the complexion was florid ; they were all healthy looking, and their occupation as market gardeners kept them in the open country air a great deal. The hair of each was fair, or a light brown. There was no deafness, and no evidence of hereditary taint. The acuity of vision in some would have been raised by cylinders, but in most a certain amount of amblyopia was present.

It will thus be seen that a father and mother free from nyctalopia, and with no history pointing to ancestors suffering from it, had 8 children living, viz., 1 daughter free from the affection, and 7 sons, of whom 6 were the subjects of retinitis pigmentosa ; the one free from the disease being only aged 13, and the youngest.

W. Einthoven (Utrecht). **Stereoscopic Effects produced by Colours.** *Thesis, Utrecht ; also in German translation in V. Graefe's Archiv., XXXI.*, 3, p. 211.

Donders remarked as long ago as 1868, that differently coloured objects on a dark background did not appear to his eyes to lie in the same plane. Thus when, for example, Roman letters 8 cm. long and 4 cm. broad, coloured red and blue in alternate lines, on a black surface, were looked at from a distance of three to four metres, the red letters appeared to him to be considerably nearer than the blue. The explanation of this phenomenon which at first suggested itself was, that owing to chromatic aberration in the eye, red objects necessitated for their accurate fixation a greater exertion of accommodation, and that this again gave rise to the idea of greater proximity. This hypothesis had, however, to be given up, as it was found that not only was there a great individual difference in the degree of the apparent separation of the differently coloured

letters, but that to some individuals the blue appeared to stand distinctly nearer than the red. It was left for Einthoven to give a true explanation of this interesting illusion. It occurred to him that, given a degree of asymmetry in the position of the retinal images of coloured objects for each eye separately, but symmetrically situated in the two eyes with respect to each other, there would be likely to be produced the stereoscopic effect under consideration. A glance at Fig. 1 will show what must result from such a want of symmetry.

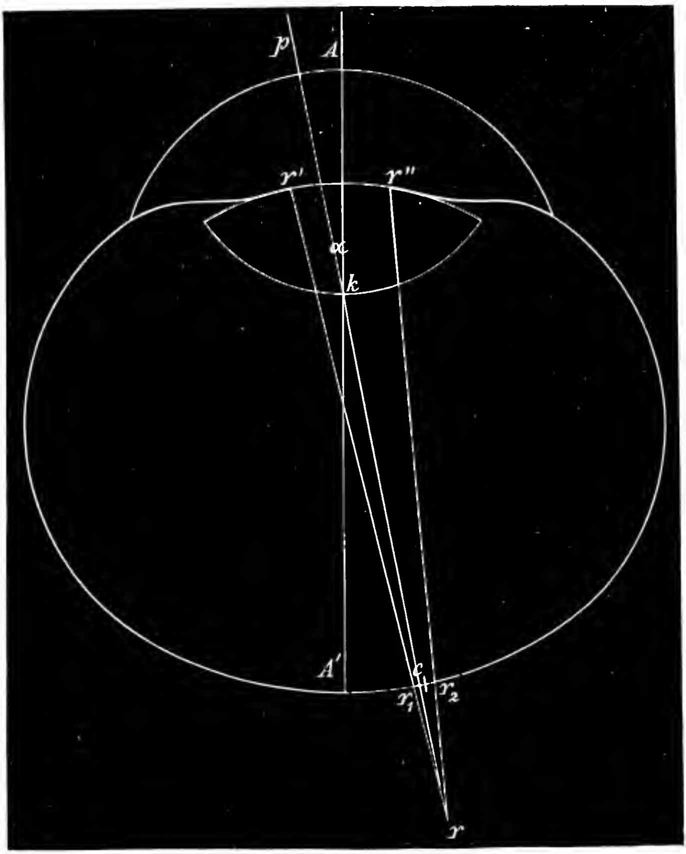

FIG 1.

In the figure A A′ is the optic axis, P k C the visual axis, making at the nodal point k the angle α with the optic axis.

Suppose the eye to be accommodated for the blue rays proceeding from any external point, these rays will meet at c, the fovea. Red rays $r' r$ and $r'' r$ proceeding from a point at an equal distance from the eye as the blue point will meet behind the retina on which they will impinge in a diffusion circle $r_1 r_2$. The central and most saturated point of this diffusion circle will, however, lie to the temporal side of C (owing to the visual axis at the plane of the pupil lying to the nasal side of the optic axis). A similar symmetrical temporal displacement will occur during binocular fixation of the centre of the diffusion circle of the red rays in the left eye. Suppose now the red rays proceed from a point a little above the blue, their image will come to lie to the temporal side of the vertical meridian through the centre of the macula, a position which, occurring symmetrically in both eyes, corresponds to those occupied by the images of an object nearer to the eyes than the point of fixation, and the impression will be that the red objects are less distant than the blue. If, again, instead of the blue the red be the rays for which the eye is accommodated, the images of the blue will be diffusion circles having their centres to the nasal side of the vertical meridian; the blue objects consequently appear further away from the eye. The effect is therefore the same in both cases, the red always appearing nearer. The demonstration given so far assumes that in the asymmetrical eye the optic axis passes through the centre of the pupil. This is the case in a number of eyes, the plane of the pupil being cut by the visual axis to the nasal side of the centre of the pupil, and the more so the greater the angle α. For such eyes red objects appear to lie much nearer to the eyes than blue. In most eyes, however, the middle of the pupil is displaced slightly to the nasal side, and when this is the case the visual axis may cut the pupillary plane in the middle, or even to the temporal side of the middle of the pupil, according to the relative sizes of the angle α and the pupillary displacement. No construction is required to show that under such circumstances the red and blue letters may then appear in the same plane, or even the blue in front of the red. The position of the pupil with

respect to the visual axis accounts, therefore, for the individual differences in the stereoscopic effect. That such is the case can also be demonstrated in a very simple and striking manner by partially covering the pupils from the temporal or nasal sides. The partial temporal occlusion corresponds to a nasal displacement and brings the blue letters apparently nearer to the eye, whilst the partial occlusion of the pupil on the nasal side, corresponding to a temporal excentricity of the pupil, produces the opposite effect and causes the red letters to stand out from the blue. Of 32 individually tested by Einthoven, with reference to the colour which appeared to them nearest to the eye, 16 saw red in front of blue, 15 blue in front of red, and to 1 only did they appear on the same level. The illusion is so distinct that all were able to state approximately the apparent distance of separation. This could be done with an astonishing degree of accuracy, as was found by measuring the distance one set of letters had to be placed behind or in front of the other in order to appear to be on the same level, and comparing these measurements with the estimates given when both actually lay at the same distance from the eyes.

Spherical glasses were also found to have an influence on the apparent relative positions of the red and blue letters. Owing to the prismatic action produced when the axes are not centred with the eye, but displaced either to the temporal or nasal side, these convex lenses produce more and more the apparent relative proximity of the blue letters the stronger and more temporally displaced they are; whilst on the other hand, displacement towards the nose brings the red forwards. Exactly the opposite effects are given by concave glasses. A glass of only one dioptre produces quite an appreciable effect in this respect. The extent of pupillary displacement necessary to produce the result found in individual cases can be estimated in the following manner:—In Fig. 2 both eyes fix the blue at point P; K d and K s are the nodal points of the right and left eyes respectively; the red point at P appears binocularly to occupy the position r; this, projected by the right eye on the plane D D′, would produce an apparent displacement ($p\ r_1$) of the red point from the blue. Taking the interocular distance

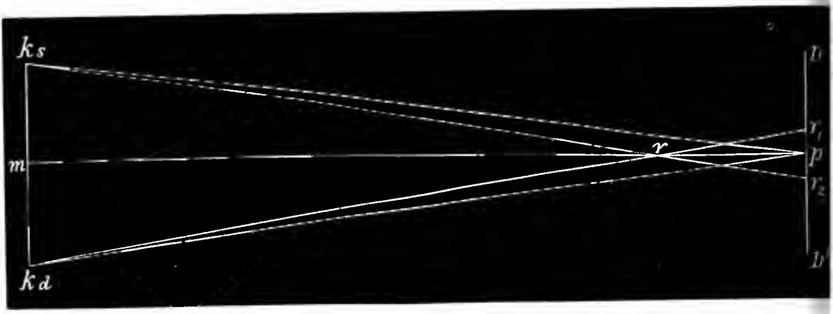

FIG. 2.

$= 60$ mm., the distance p m $= 3.0$ metres, and as Einthoven estimates in his own case, $p\ r = 40$ mm., we get by similar triangles for the value of $p\ r_1$ 0·405 mm. To find next the degree of excentricity of the pupil, which makes $p\ r_1 = 0{\cdot}405$ mm., we first find the size of the retinal image β of an object $p\ r_1$ at a distance $p\ m$ from the formula

$$\frac{\beta}{p\ r_1} = \frac{G}{m\ p}$$

where G = distance from nodal point to fovea, say 15 mm. This gives $\beta = 0{\cdot}002$ mm. Finally to find what deviation of the visual axis from the middle of the pupil corresponds to this value of β, we have in Fig. 3, $i\ i'$ the plane of the pupil, $n\ n'$ that of the retina, with C the fovea, S the point at which the visual axis cuts the pupillary plane, and m the centre of the

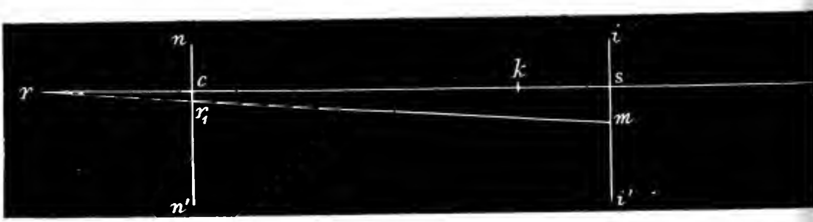

FIG. 3.

pupil. The eye is accommodated for the blue rays of the pt. P, these are focussed at C; the red rays meet consequently

somewhere along the prolongation of sc at r; the centre of their diffusion circle on the retina is at r_1 where mr cuts nn'; β is thus represented by cr_1 and

$$\frac{sm}{cr_1} = \frac{sr}{cr}$$

$sr = sc + cr = 19 + 0{\cdot}4$ (the calculated difference in the focal distances for the colours experimented with). This gives $sm = 0{\cdot}1$ mm., a value which shows how small a displacement of the visual axis from the middle point of the pupil is necessary to produce a very marked apparent difference in the distances of the red and blue letters from the eye. The stereoscopic effect is much less apparent for coloured letters on a white background. On accurately accommodating for a white object there is, under ordinary circumstances, no appearance of colouring of the margins, though such might be expected from what precedes; this is owing partly to the greater intensity of the rays of greater refrangibility. The bordering colours appear, however, and this Newton seems to have known, if the pupil be partially covered. But as in most eyes Einthoven had found a certain degree of decentering of the pupil with respect to the visual axis, it occurred to him that these coloured borders should be to some extent apparent without covering the pupil. And, indeed, on accurate fixation with one eye of a small black rod held at arm's length in front of a white surface, it was found to be coloured red and blue at its borders. This effect entirely disappears in binocular fixation, owing to the more or less complete neutralisation which results from the red and blue falling on similar points on the two retinæ. The same circumstance accounts for the very slight stereoscopic effect obtained when the red and blue letters are against a white background. Curiously enough, the stereoscopic effect, which is the subject of Einthoven's investigations, appears in no way to influence the process by which our binocular vision makes us conscious of the third dimension, and it is difficult to understand in what manner, if at all, it is of use for vision.

GEO. A. BERRY.

C. B. Lockwood (London). Anatomy of the Muscles, Ligaments, and Fasciæ of the Orbit, including an account of the Capsule of Tenon, the Check Ligaments of the Recti, and the Suspensory Ligament of the Eye. *Journal of Anatomy and Physiology, October*, 1885.

Notwithstanding that so much has been written on the anatomy of the orbit, Lockwood may, we think, claim to have cleared up and added to our knowledge on the subject; this chiefly by the use of frozen sections and by numerous special dissections. We cannot pretend to give the numerous details investigated by Lockwood, but shall indicate a few of them.

(1) With regard to the origins of the ocular muscles he has little to add to the received account, but he shows that we have been in the habit of looking at only one side of these origins. Their orbital surfaces, he says, look fibrous, and seem intimately blended with the sheath of the optic nerve and the fibrous tissue which surrounds the optic foramen; from their inner ocular aspect they look tendinous, and may be said to arise by a superior and inferior common tendon.

(2) The chief interest of the communication lies in the account of the capsule of Tenon. This structure, as ophthalmic surgeons well know, is of much practical importance, but our knowledge regarding it is of the most meagre and unsatisfactory character. Lockwood describes it as a fibrous capsule which surrounds the globe from the ciliary margin of the cornea backwards to the entrance of the optic nerve; its anterior third intimately related to the back of the ocular conjunctiva; its middle third sending prolongations to the muscles of the eye; its posterior third in contact with and loosely adherent to the orbital fat. In addition, it is attached in a manner subsequently indicated to the inner and outer sides of the orbit and is continuous posteriorly with the sheath of the optic nerve, being adherent for about the space of a quarter of an inch round the margin of the lamina cribrosa.

(3) Six muscles receive prolongations or sheaths from the capsule of Tenon—the four recti, the superor and inferior oblique. These prolongations spring from the middle third of the capsule and pass backwards along the recti as far as their middle, where they blend with their perimysium.

The sheath for the superior oblique surrounds its reflected tendon as far as the pulley and is there attached. The prolongation to the inferior oblique descends upon the muscle as far as the floor of the orbit. By means of expansions from their sheaths the internal and external recti are connected with the lachrymal and malar bones. These expansions, of which the external is the stronger, are partly muscular. They have been called the internal and external check ligaments, and were supposed by Tenon to alter the direction of the muscles and so prevent them, when in action, from pressing on the globe. This latter function from their attachments Lockwood denies to them, but he considers that they certainly limit the contraction of their respective muscles.

(4) The sheath of the superior rectus is intimately connected superiorly with the connective tissue sheath of the levator palpebræ, also with the tendon of the superior oblique, and sends muscular fibres on to the palpebral aponeurosis and superior tarsal cartilage. The palpebral aponeurosis, or anterior expansion of the levator palpebræ, is attached on each side of the orbit, and hence it acts as a check ligament for both the superior rectus and the levator, producing the visor-like action of the upper lid.

(5) The sheath of the inferior is, in a somewhat similar manner, connected with the connective tissue sheath of the inferior oblique, but it also forms by a splitting from its under surface "the suspensory ligament of the eye."

(6) This is a band of fibrous tissue, stretched like a sling from one side of the orbit to the other, inserted into the malar and lachrymal bones, and forming a shallow cup in which the eye rests. It is intimately blended with the under part of the capsule of Tenon, and will support the eye in position after excision of the superior maxilla, although subsequent cicatrization may drag it down. Anteriorly it is attached to the inferior tarsal cartilage, and it is through this connection that the inferior rectus is able at the same time to depress both the cornea and the lower lid.

(7) The inner surface of the tough, matted membrane described above as the capsule of Tenon is, according to Lockwood, lined with loose areolar tissue, which surrounds the sclerotic and intracapsular portions of the muscles. The first has

been termed "tunica vaginalis oculi," or "tunica albuginea." The second Lockwood proposes to call "tunica adventitia oculi." The ocular edges of the slits in the capsule of Tenon, through which the muscles pass, are thickened into what he terms "intra-capsular ligaments," sufficiently strong, in his estimation, to act as pulleys, protecting the globe from pressure during the action of the muscles. Lockwood gives several figures illustrating the points discussed in his paper, and he also furnishes full quotations from the works of Tenon, Bonnet, Ferrall, and Lenoir.

A. S. Morton and J. W. Barrett (London). **A Clinical Investigation of the Merits of Various Methods of Practising Retinoscopy.** *Brit. Med. Jour., Jan.* 16, 1886.

With the object indicated by the title of their paper, the authors have accurately examined a series of cases, comprising a total of thirty eyes, in a systematic manner, under different conditions. They tested the refraction by retinoscopy at the optic disc, and at the macula lutea, first without, and then with, atropine; they further compared the advantages of three kinds of mirror, viz., one plain, one of 25 cm. focus, and one of 40 cm. focus.

They formulate their conclusions as follows:—

1.—In order to be perfectly accurate, retinoscopy must be practised at the macula lutea, and with the aid of some such drug as atropine.

2.—Retinoscopy at the optic disc, in the majority of cases (especially hypermetropia), gives approximately correct results, and from the great ease with which it can be practised, its employment is justifiable in cases (such as post polar cataract) in which it is necessary to estimate the refractive character of the eye approximately, and in which retinoscopy at the macula lutea is difficult, or impossible to practise.

3.—Retinoscopy, without the previous use of atropine, is unreliable; but it would seem from these experiments that, if the drug cannot be employed, approximately correct results

may be obtained by practising it at the optic disc in the manner previously indicated. The glass which reverses the shadow may generally be ordered.

4.—If the best possible results with least trouble be required, it should be practised with a mirror of thirty-six centimetres focal distance, at a distance of a little over one metre, with as small a flame as possible; the patient should be directed to look at the small hole in the mirror, while a screen is placed in front of his other eye.

5.—The two meridians of greatest and least refraction respectively should be steadily worked out, until just over-corrected. The difference between the two results gives the cylinder required, which cannot vary more than ·5 D. The spherical glass may require lowering or increasing slightly in hypermetropia and myopia respectively, but in the former case, more alteration is required than in the latter.

The glasses so determined should be tried under atropine, and, if correct, should then be obtained and worn at once.

While acknowledging the accuracy and the value of this investigation, we must dissent somewhat from the advice which the authors have based upon their results. In the absence of atropine it is certainly seldom possible to practise retinoscopy exactly at the macula lutea, but there is, we think, no good reason, under ordinary circumstances, for selecting the disc as the point of regard, and, indeed, the frequent presence of an excavation at its centre renders it particularly unsuitable for the purpose. It is better, we think, to tell the patient to look at the observer's forehead; the point illuminated is then vertically over the macula and nearer to it than the disc, but is still sufficiently removed from it to obviate excessive contraction of the pupil. Again, our experience is, that in the majority of cases we serve our patients better by correcting the manifest hypermetropia, with perhaps a little of the latent, more or less according to age, as Donders originally advised, strengthening the glasses after an interval of weeks or months if it should prove necessary, than by at once giving the full correction as revealed by atropine, and acting on this principle we are able, in a large number of cases, with ease and advantage, to make use of retinoscopy without either dilating the pupil or paralysing the ciliary muscle.

CHARLES STEDMAN BULL (New York). **Two Cases of Unilateral Temporal Hemianopsia.** *Trans. Americ. Ophthal. Soc.*, 1885.

Unilateral Temporal Hemianopsia, with Central Scotoma of the other Eye.—A retired officer, aged 66 years, had been struck by lightning in 1849, and fell to the ground unconscious. When he recovered consciousness several hours later, he was blind in both eyes but rapidly regained vision, and after a few days had perfect possession of his faculties. He remained perfectly well till 1857, when the muscles of the left thigh and leg began to atrophy, and at the same time there suddenly appeared a temporal hemianopsia of the right eye. The wasting of the left lower extremity progressed steadily for two years, after which it stood still. No change either in field or acuity occurred in the right eye after the hemianopsia appeared, but in December, 1883, six months before Dr. Bull saw him, there occurred a sudden central obscuration of the vision of the left eye, which persisted. There was no history of rheumatism or syphilis, and no evidence of renal or cardiac affection, with the exception of attacks of sudden faintness. All his life he had been an excessive chewer and smoker of tobacco. V. of R. = $\frac{15}{30}$, with no vision on temporal side of median vertical plane. V. of L. $\frac{6}{100}$ excentrically; central scotoma 20° by 30° in extent, with peripheral contraction of field. Discs both dirty grey and excavated, with blurred outline on the left side as after neuritis. Retinal hæmorrhage at the left macula variously coloured, having evidently occurred at different periods. Colour vision in the left eye was defective for all but blue; in the nasal half of the right field it was normal, though sluggish. V. improved to $\frac{15}{40}$, excentrically on nasal side, with partial absorption of the hæmorrhage.

Unilateral Irregular Hemianopsia with Concentric Limitation of the Field of Vision of the same Eye.—A gentleman, aged 60 years, had three months before been knocked down and trampled upon by a horse. When picked up he was unconscious, and had an extensive laceration over the frontal bone above the left eye. After a short period of consciousness he became again unconscious, either semicomatose or delirious. The scalp wound, three inches long, extended from above, close to the hairy scalp, downwards and inwards towards the

median line of the left eyebrow. Beneath it was a depressed fracture of considerable extent. He was not trephined. Erysipelas of the scalp set in, with swelling of both eyelids sufficient to close the eyes for several weeks. When this had disappeared and consciousness returned there was left temporal hemianopsia. V = $\frac{15}{70}$ in each eye, and with + 2 D Sph. = $\frac{15}{15}$. With + 4 D Sph. he read Sn. 0·25 at 10″. R. field normal, L. irregular temporal hemianopsia. Colour- vision unaffected. R. fundus normal. L. disc white with reduced arteries. Six months after the accident the nasal half of the left field, previously of almost normal extent, was considerably narrowed, and it seems clear, Dr. Bull believes, that the amblyopia is progressive and that the pseudo-hemianopsia will end in complete amaurosis of one eye. The cause may have been an extension of the line of fracture of the frontal bone back to the optic foramen, involving the optic fibres distributed to the nasal half of the retina.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, MARCH 11TH, 1886.

JONATHAN HUTCHINSON, F.R.S., President, in the Chair.

Deposit in the Cornea. — Mr. Lang showed a patient in whom corneal opacities appeared to be due to the presence of granules of a foreign body in the cornea. Eserine had been used in the treatment of an antecedent corneal ulcer, and six grains of quinine had been given daily. Mr. Lang entertained the opinion that the granules in the cornea were quinine, chiefly on the ground that the opacity was fluorescent to oblique illumination. Vision was good.

Mr. Tweedy, while agreeing that the opacities had a peculiar fluorescent aspect, questioned whether this was due to quinine; he had been in the habit of using pure English sulphate of quinine, as a lotion in intractable ulceration, for at least twelve years, and had never seen such an opacity produced.

Mr. Nettleship said the appearances in the case were certainly peculiar, and unlike all ordinary cases of opacity.

Mr. M'Hardy had frequently used quinine and eserine simultaneously, but had never seen any such deposit.

Panas' Solution.—Mr. Edgar Browne, referring to a statement made at the last meeting by Mr. Brudenell Carter on the authority of an analysis made by Messrs. Corbyn, to the effect that the solution recommended by M. Panas contained no mercury, said that a careful examination showed that the fluid in question did contain mercury, though probably not in solution, but in a state of fine suspension. The fluid was probably rather aseptic than antiseptic.

Model of Movements of Eyes.—Mr. Adams Frost. The eyes were represented by two wooden spheres, each moveable in all directions round its centre by means of a double gimble-joint. The muscles were represented by cords, having points of attachment and lines of traction exactly similar to those of the natural muscles. The cords were acted upon by rotating three drums, upon which they were wound. The upper of these controlled the lateral recti rotation in one direction, producing conjugate movements to the right, and in the other to the left. This drum was divided in its centre, so that if its two halves were rotated in opposite directions, convergence or divergence was produced. The second drum acted upon both superior or both inferior recti, according to the direction in which it was turned, while the lowest acted upon the superior or inferior obliqui in the same way. Any of the natural movements could be produced by combinations of these movements. The suggestion to divide the uppermost drum to produce convergence or divergence was due to Mr. Paxton, of Messrs. Pickard, Curry, and Paxton.

Report on Sympathetic Ophthalmitis.—The Report of the Committee on Sympathetic Ophthalmitis was read by Mr. Nettleship. It was based on a detailed analysis of about 200 cases of sympathetic ophthalmitis collected by the Committee as bearing upon certain points in its nature and treatment. About eighty of these were contributed by members of the Society, to whom a circular had been sent; the rest were from published sources. It dealt especially with the points here italicised:—

(*a*.) *Excision of the Exciting Eye.*—The conclusion arrived at was that whilst removal soon after the onset of the sympathetic

inflammation had not been proved to have any marked effect on the progress of the sympathetic disease, it certainly did not increase its severity; comparing equal numbers of cases in which the exciting eye was, and was not, removed (soon after the onset of the sympathetic disease), the proportion in which the disease was fatal to sight was much greater in the latter group than in the former; the apparent value of this evidence in favour of early excision, however, was somewhat diminished by evidence of another kind which tended to show that the excess of recoveries after excision was partly due to the natural mildness of the disease in that group, and the excess of losses when excision was not done, to its natural severity.

(*b.*) *Mercury.*—The conclusion was tentatively arrived at that the drug had little, if any, effect; of fifty cases which recovered completely, and were treated locally in much the same way, mercury was administered in exactly one-half.

(*c.*) *Effect of Operations* (*Iridectomy*), *on the Sympathising Eye.*—These when performed early in the disease appeared to be less unfavourable than is commonly held. In a small series of cases, an iridectomy had been performed on the exciting eye soon after the sympathetic inflammation had set in, and in nearly all with a favourable result to both eyes.

(*d.*) *Sympathetic Ophthalmitis set up by Eyes in which no Perforation had ever taken place.*—After a very careful and thorough examination of cases, the Committee had come to the conclusion that the occurrence of the disease without perforation of the exciter, if known at all, was, at any rate, extremely rare.

(*e.*) *Longest and Shortest Intervals between the Lesion of the Exciting Eye and the Onset of Sympathetic Disease.*—Only about a dozen cases were found in which an interval of more than a year occurred, unbroken by recurrences of inflammation in the exciting eye; and only eighteen in which the interval was a month or less. The longest interval where the exciter had been wounded was twenty years, the shortest nine days. There seemed to be reason for believing that the length of the interval was not without influence on the severity of the sympathetic ophthalmitis; the proportion of cases in which blindness ensued being considerably greater when the disease had set in after a long, than after a short, interval.

(*d.*) *Onset of Sympathetic Ophthalmitis after Excision of the Exciting Eye.*—About thirty cases had been collected; in five the disease had appeared as much as from four to eight weeks after excision; in all, the exciting eye had been wounded, and had been left long enough to undergo changes capable of setting up the disease, and the conclusion was drawn that, in these cases, the sympathetic attack was due to the influence of the wounded eye, and not to the operation for its removal. The prognosis in these cases was shown to be much better than in ordinary cases, as more than half recovered entirely.

After reference to certain anomalous cases happening many years after excision, and to others where iritis followed the removal of the exciter within a day or two of the injury, the Report concluded with a notice of the cases of so-called *uncomplicated sympathetic neuritis.* It had been found that these cases differed much amongst themselves, and probably could not all be ascribed to the same cause, nor be taken as pointing to transmission along the optic nerves; whilst the papillitis which often occurred early, and remained late, in ordinary cases of sympathetic ophthalmitis was far from proving that mode of transmission, since the same papillitis was commonly seen in cases of idiopathic serous iritis, even when only one eye suffered. The statements and conclusions in the Report were illustrated by cases, and verified by numerous references.

The President said the Report gave evidence not only of much labour, but of excellent judgment, and was of the highest value. A vote of thanks to the Committee was unanimously adopted.

Double Optic Neuritis in Cerebral Hæmorrhage.—Dr. Bristowe. A musician, aged 55, was first seen on January 19th. It appeared that he had suffered from headache for one year, and dimness of sight for six months; but there had been no paralysis, double vision, or fits. At 10.30 p.m., after supper, on December 26th, 1885, loss of consciousness and right hemiplegia suddenly occurred. The patient remained drowsy and stupid, took but little notice of his surroundings, and passed his evacuations into the bed. The arm and leg were absolutely paralysed; the plantar reflex on the right side was diminished. There was no clonus, and the knee-jerks were not exaggerated. There were complete hemi-analgesia and

hemi-anæsthesia, but the special senses could not be investigated. Temperature 97.4°; pulse 90°, strong; no albuminuria. For ten days the patient became no worse; then he became more drowsy, and absolutely speechless. Some stiffness of the right arm came on. The head and eyes, though turned to the left, could be moved to the right. Mr. Nettleship examined the eyes on January 30th, and found papillo-retinitis, with hæmorrhages. The patient gradually became worse, and died comatose on February 12th. *Necropsy*. The spinal cord and membranes of the brain healthy. Arteries atheromatous. A blood-stained area, of the size of a threepenny-piece, was seen on the surface of the posterior part of the left optic thalamus; this was the external evidence of a large cavity, of the size of a pigeon's-egg, containing a partly decolourised clot in the optic thalamus. The hæmorrhage had ruptured the posterior limb of the internal capsule, and extended into the white matter of the temporo-sphenoidal lobe. The lenticular nucleus was also damaged at its posterior part. The heart weighed 17½ ounces, being much hypertrophied; the kidneys were healthy. Dr. Bristowe remarked on the unusual position of the hæmorrhage, and the rarity of the association of such optic neuritis with simple cerebral hæmorrhage.

Dr. Hughlings Jackson said that Dr. Bristowe had described a condition which must be exceedingly uncommon. There was a liability to error, in that hæmorrhage might occur from cerebral tumour. On the other hand, a large blood-clot might be regarded as a foreign body. The fact that there was conjugate deviations of the eyes and head for from five to six weeks was remarkable, for this symptom was usually transitory.

Dr. Sharkey said there was no evidence of glioma in the tissue around the clot. The hypertrophy of the heart was unexplained. There was no doubt of the extreme rarity of optic neuritis associated with ordinary cases of hæmorrhage, which usually occurred in the anterior portions of the internal capsule. In the present case there was rupture, and not mere pressure on the posterior third of the posterior segment of the internal capsule, and thus the optic radiations of Gratiolet were also damaged. He suggested that an explanation of the occurrence might be found in the unusual position of the hæmorrhage, damaging at the same time both sensory and motor paths.

Primary Glaucoma in Relation to Age.—Mr. Priestley Smith read a paper on this subject. With the help of members of the Society, he had collected one thousand cases of primary glaucoma, and had classified them according to the age at which the disease began, the sex of the patient, and the type of the glaucoma. From these cases calculations had been made, with the help of life-tables, to show what the distribution would be if persons of both sexes and all ages were equally numerous. These represented the relative liability of persons of different ages and the two sexes. The results, shown in a series of tables and charts, led to the following conclusions :—

(*a.*) *Frequency.*—1. Primary glaucoma is extremely rare in childhood and youth. 2. Its frequency increases, slowly at first, then more rapidly, up to the sixth decade ; between sixty and seventy it is about as frequent as between fifty and sixty ; after seventy its frequency declines. 3. Cases beginning after fifty are about twice as numerous as cases beginning before fifty. 4. Females suffer in rather larger number than males. 5. The non-congestive form is commoner in males than in females. 6. The congestive forms are much commoner in females than in males.

(*b.*) *Liability.*—7. The liability is extremely slight in childhood and youth ; at least one hundred times less in the second decade than in the seventh. 8. The liability continually increases up to the seventh decade ; between sixty and seventy it is at least twice as great as between forty and fifty. 9. After seventy years of age the liability appears to diminish, but the statistics cannot be relied upon, for very old people are less able to come up for treatment than those who are younger. Figures were quoted from the Manchester Eye Hospital Reports in proof of this assertion. 10. The liability of females is rather greater than that of males. 11. The extra liability of females pertains to the whole of life, except, perhaps, to the periods before thirty and after seventy, concerning which the data are insufficient for generalisation. 12. The extra liability of females relates to the congestive forms of the disease, not to the non-congestive.

The foregoing statistical results were applied by the writer as a test of the glaucoma theory arrived at by other means. His first investigation of the subject eight years ago had led by

inference to the conclusion that a change of form in the crystalline lens is concerned in producing primary glaucoma. Starting from this inference, a fresh inquiry proved that the lens continues to increase in size throughout life. The pathological position was then as follows :—As age advances, the lens steadily encroaches on the space in which it lies, the structures surrounding it attaining their full dimensions early in life. The margin of the lens is thus brought into closer and broader relation with the ciliary processes, and the depth of the anterior chamber is lessened—changes which, though ordinarily compatible with the integrity of the eye, involve an increasing liability to glaucoma. The highly vascular processes vary much in size according to the quantity of blood in their vessels, and, if the space available for such variations be unduly encroached on, they are restricted in the direction inwards, and forced to expand forwards; in so doing they press forward the base of the iris, and narrow the angle of the anterior chamber, causing obstruction of the filtration channels, and thus glaucoma. Evidence on these points had been published by the author in previous papers.

Having discussed the several predisposing and exciting causes of the disease, the writer showed that the analysis of his statistics gave strong support to the theory connecting the increasing liability to glaucoma with the continuous growth of the lens. He concluded by drawing the following analogy between an acute glaucoma and a strangulated hernia :—Protusion of the bowel is a condition, mechanical in its origin, which for a long period of time may have no serious consequence, but which may at its very outset, or at any later time, under a slight constriction, be transformed into one of acute and dangerous strangulation, with intense engorgement of vessels and outpouring of serum in the directions of least resistance. In the eye threatened by glaucoma, there is an unfortunate relation of parts, which, though not itself a disease, may lead, through a little further encroachment upon the already narrowed space, to one of the most formidable of ocular disorders, involving stoppage of the intra-ocular currents, strangulation of the circulation, and escape of serum into the transparent media and the conjunctiva. Just as the taxis will occasionally remedy the displacement, and terminate the danger in the one case,

so, in a few instances, will eserine re-open the outlets, and relieve the tension in the other; but just as in strangulated hernia it is generally necessary to at once relieve the constriction with the knife, so in most cases of acute glaucoma, the only means of cure is to promptly unlock the eye by iridectomy.*

Central Blepharoraphy.—Dr. Argyll Robertson read a paper on the operation of central blepharoraphy after enucleation. Many patients were unable to afford the expense of an artificial eye, or were unable to replace artificial eyes, or the resulting conjunctival cavity was unfitted for an artificial eye. In these cases, considerable deformity and discomfort were liable to arise in the conjunctival sac: papillomatous growths might occur, or the upper lid fall in and the lower one gravitate downward, leaving the conjunctival sac exposed to various irritations. To prevent these consequences, Mr. Streatfeild, about twelve years ago, recommended the removal of the conjunctival sac by dissections and caustics after enucleation. Dr. Argyll Robertson considered central blepharoraphy simpler, and quite as effective in preventing the evil consequences of enucleation. The lower lid was grasped with a pair of stout forceps held parallel to the edge of the lid, and the conjunctival covering of the free edge of the lid dissected off with a cataract-knife to the extent of five or six millimetres, corresponding to the centre of the lid, care being taken not to damage the roots of the eyelashes. The upper lid was treated in the same way, and both were brought together by means of a horsehair ligature No drainage was needed. Healing took place readily by first intention, and on the fourth or fifth day the ligature might be removed. The operation could also be employed for long-standing spasmodic ectropion of the upper eyelid. In this affection, the tarsal cartilage had a faulty curvature. After the eyelid had been kept by the central blepharoraphy in its natural position for some time, the tarsal cartilage regained its normal curvature, and the adhesions might be divided. Dr. Robertson had operated on two such cases with very successful results.

Dr. Brailey said the latter operation had been performed for some years past in cases of corneal opacity.

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* I learn with much interest from Mr. Anderson Critchett that the late Mr. George Critchett was accustomed to make this same comparison between acute glaucoma and strangulated hernia.—P. S.

Mr. Tweedy had employed a kind of peripheral blepharoraphy, leaving a central fissure through which vision was possible, in cases of painful ulcers of the cornea, and in ectropion of the lower eyelid due to caries about the orbit. He mentioned the case of a lady who had had this peripheral operation performed five years ago, and who refused to have the adhesions broken down, because she felt contented in her present state.

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Meyhöfer (Görlitz). Etiology of Cataract. Cataract in Glassworkers. *Klin. Monatsbl. f. Augenheilk. Feb., 1886, p. 49.*

During a period of little more than two years Meyhöfer met with four instances of cataract amongst glassworkers under conditions of similarity, which led him to suspect that the opacity of the lens was in some way due to the nature of the work in which the men were employed. Thus, all four patients were healthy young men between the ages of 24 and 29, a period of life at which cataract, other than traumatic, is rare. In all the left eye was chiefly or solely affected. Other signs of disease, especially regarding the urine and the vascular system, were absent. In face they all presented an appearance almost constantly met with amongst men who work at glass furnaces, viz.:—a brownish red discolouration of the skin, due partly to pigmentation, partly to increased vascularity, most marked on the left side of the face, and caused by the intense radiant heat from the furnaces.

Following up this clue he examined the eyes of a large number of glassworkers in the neighbourhood of Görlitz, confining his observations to those engaged in blowing, or in otherwise working the glass close to the open furnaces.

He examined 506 youths and men, of whom the youngest was 15, the oldest 81 years of age. 134 were under 20 years of age; 212 between 20 and 30; 96 between 30 and 40; 45 between 40 and 50; 16 between 50 and 60; 2 between 60 and 70; 1 over 80.

In 59 of these persons, *i.e.*, in 11·6 per cent., he found more or less opacity of the lens, and this high percentage became all the more remarkable when considered in connection with the ages of the affected individuals. Thus, among 442 persons under 40 years of age, 42, *i.e.*, 9·5 per cent. showed lental opacities, viz.:—6 in the second decade, 20 in the third,

and 16 in the fourth. While among 64 men over 40 years of age, the time of life at which cataract is common, only 17, *i.e.*, 26·5 per cent. were similarly affected.

The characters of the cataract were not different in any way from those of ordinary cataracts in young persons, except that the left eye was affected much more than the right, viz.:—the left eye only, 19 cases; right eye only, 7 cases; both eyes, 16 cases. No changes in the fundus were discoverable with the ophthalmoscope.

The only constitutional disorder known with certainty to cause cataract in young adults is diabetes. Meyhöfer was able to examine the urine in only 8 of his cases; in these there was no trace of sugar. He states, on the authority of colleagues who have had wide experience amongst glassworkers, that they present no special liability to diabetes, and therefore negatives the idea that the remarkable frequency of cataract could be connected with this disease.

There are two conditions noticeable in connection with the work which appear capable of explaining the injury to the eyes, viz.:—the intense radiant heat, and the copious loss of fluid by perspiration. Before the legislation of 1869 children were put to the trade at 8 years old, or even earlier. At present they begin usually between 12 and 14, and take to the regular furnace work a year or so later. During ten or twelve hours daily, week-days and Sundays without a break, they carry on this work, usually for forty or forty-five weeks in succession, at the end of which time comes an interval of about eight weeks for the repair of the furnace. The heat to which the face, especially its left side, is exposed time after time in taking the molten glass from the furnace is intense; a thermometer hung for ten minutes in the same position indicated 65°C. (= 149 F). Permanent changes in the skin of the face, due to the heat, are visible in almost all the workmen; there is a reddish-brown discolouration and, sometimes, a dried-up, leathery condition; in some there is a cicatricial formation, causing ectropion of the lower eyelid, and indicating actual inflammation of the skin.

The excessive and continuous sweating is, of course, a safeguard against the heat; in its absence the skin would necessarily be burnt. There is probably no occupation, not excepting that at the iron-smelting furnaces, in which the heat, and conse-

quently the loss of fluid by perspiration, are so great. It is noteworthy also that the wages of the glassworkers are high, and that they feed well; in no case was there any reason to suppose that general malnutrition was the cause of the cataract.

In view of the fact that the left eye is much more liable to suffer than the right, Meyhöfer regards the direct influence of the heat as the chief factor; but since the right eye suffers also, though in less degree, he thinks that the indirect effect of the heat, viz.:—the loss of fluid from the body, is also concerned in the process, and compares this with the conditions which are present in diabetes. His observations agree with the supposition, as yet unproved, that the formation of cataract in connection with diabetes is due to the excessive loss of fluid.

He refers, in conclusion, to the fact that the progress of a cataract may be much accelerated by intercurrent maladies of an acute or exhausting kind, and suggests that this also may be due to a loss of fluid in association with the febrile state. Observations showing whether it is the fact that an acceleration of cataract is especially liable to occur in connection with the sweating of acute diseases are almost entirely wanting. The author mentions one case in which a man suffering from senile cataract in both eyes was, under his observation, nearly five years waiting for the opacity to mature sufficiently for operation. The progress was extremely slow until the patient was attacked with pleuro-pneumonia. During this attack and during the convalescence there was excessive perspiration, and at the same time vision deteriorated rapidly. By the time the patient had recovered, both cataracts were ripe for extraction.

L. Wolffberg (Berlin). A Case of Abnormal Single Vision, depending on Illusion. *Centralbl. f. prakt. Augenheilk. Feb.,* 1886, *p.* 33.

The author describes a peculiar visual disturbance which appears not to have been met with before. Any two small objects of similar kind standing very near together were seen by the patient as one, whether regarded with one eye only, or with both; a phenomenon which would seem to be in some sense the counterpart of the inexplicable monocular diplopia in which a single retinal image gives rise to two mental

impressions, several instances of which have lately been recorded in the Transactions of the Ophthalmological Society.

The patient was a man, aged twenty-five, a hotel servant, of lively temperament and moderate intelligence. He stated that the disturbance of vision had begun suddenly about a month before, without known cause. It did not interfere with his work, but made him very anxious. His sight had hitherto always been perfect; his health had been good; he had no injury of the head, and no headache. Sexual excesses were denied. The family history was negative.

Both eyes E., V. more than normal. Colour and light perception normal, at the macula and elsewhere. Pupils medium sized, active. Accommodation and movements of eyes, normal. Fundus, healthy. Other senses, especially touch, normal. Head of good form, nowhere painful on touch or percussion. Urine, s.g. 1015; no sugar or albumen.

The patient demonstrated his ailment in this way: he wrote e e, and asserted that he saw only one e; he wrote 122, and saw 12 only. He drew two parallel vertical lines, and saw only one; he said that by sloping the lines to either side, or by inclining the head, he could bring both lines properly into view, but that this manœuvre helped him only for an instant.

An accurate examination showed the following points:—1. The abnormality of vision was the same with each eye only, as with both together. 2. It was independent of the nature of the object looked at: thus, two similar figures, letters, strokes, or crosses, were seen single when close together; congruity of the two was not essential, for two strokes of different sizes gave the same result; more than two did not blend. 3. Two similar objects of different colours caused contest of the visual fields; according to the patient, the one colour sometimes surrounded the other. 4. Two similar letters of ordinary size (1 to 4 mm. high) at a distance of 40 cm. (16 inches), ceased to blend when separated horizontally more than 4 cm. (1·5 inch), or vertically more than 2.5 cm. (1 inch). At a distance of 6 metres Snellen's 6 m. type blended when separated not more than 80 cm. (31·5 inch) horizontally, or 50 cm. vertically, showing that the abnormal single vision occurred only within the limits of the macula lutea. 5. The

position of the blended image corresponded with that of the object actually fixed; the position of the lost image was not recognised as a defect in the field. 6. Stereoscopic vision showed no peculiarity beyond that which would necessarily result from the abnormality described.

The author finds no similar case on record. He suggests that the phenomenon finds an analogue in normal acts of vision, viz., in the blending of non-coincident images belonging to the two eyes respectively. In the normal binocular visual field the two images of the object looked at fall upon corresponding points of the two retinæ, and are natually seen single; but many of the other objects pictured on the retinæ at the same time form images which do not fall upon corresponding points, and should therefore be seen double. Yet all objects thus pictured are usually perceived as single. Thus, under ordinary circumstances, there appears to be a blending of non-coincident images belonging to the two eyes; in the particular case before us there was a blending of non-coincident images in each individual eye. In either case the result of the blending must be termed an illusion, since the mental impression produced does not correspond with the impression actually received by the visual organs. In the case of the normal binocular blending, our knowledge that the object is actually single, and the ease with which we bring its images absolutely together by direct fixation, aid the imagination to blend the non-coincident images. The special cause of the peculiar illusion in the case here recorded must remain unknown.

R. Hilbert. On Chromophobia, or Dread of Colours. *Centralbl. f. prakt. Augenheilk., Feb., 1886, p. 43.*

The author holds that cases of chromophobia, though they have been rarely recorded as such, are not very uncommon, and that they deserve attention as examples of perversion of the colour-sense. In the cases to which he refers, pathological changes in the visual organs are not discoverable, and the morbid sensation does not occur as a subjective phenomenon independent of objective colours; in the persons affected, an objective colour produces an excessive and disagreeable effect.

The first recorded case is by Woinow (v. Graefe's Archiv., XVII., 2, 1871); the subject of it was a colour-blind person specially affected by red. Hasner published three cases, presenting dread of white, dread of red, and dread of blue respectively (Centralbl. f. pr. Augenh., 1881, p. 1). Schröter followed with two cases: dread of blue in a patient with atrophy of the optic nerves, and dread of red in an otherwise healthy man (the same, 1881, p. 61). Mayerhausen described two more cases of dread of red, in nervous and highly excitable persons (the same, 1882, p. 48). To these eight cases Hilbert now adds another.

A student, twenty-six years of age, came to consult him on account of a chronic follicular conjunctivitis. A sheet of carmine red paper happened to lie upon the table. The patient started when he saw this, closed his eyes, and begged that it might be removed. He stated that from the earliest childhood the sight of red objects, clothes and such like, had distressed and excited him. Other colours, shining surfaces, and bright light caused him no inconvenience. The patient was a small, weakly man of restless and excitable temperament, and somewhat hypochondriacal. He had a slight myopia, with normal acuteness of vision; the media and fundus were healthy in both eyes.

In the cases hitherto recorded, including Hilbert's, red was the colour dreaded in six cases, blue in two, and white in one; whether other colours ever have a similar effect there is no evidence to show. In all the cases but two the eyes themselves appeared to be healthy, but in every case there was a certain over-excitability and nervousness of temperament, and this, no doubt, underlies the special liability to excessive impression in the visual centres. The author regards the symptom as a central one, and not as a sign of disturbance in the retina.

We would recall in this connection another observation published by the same author: a peculiar symptom of fatigue in the visual nervous system, and its relation to erythropsia (*vide* O. R., Vol. IV., p. 44), and other records of subjective red vision which have appeared in these pages. It is interesting to note that the particular objective colour which is the offender in the majority of cases of chromophobia corresponds with the abnormal subjective colour sensation met with in the commonest form of chromopsia, viz., in erythropsia.

Strümpell (Leipzig). On a Case of Progressive Ophthalmoplegia. *Neurolog. Centralbl.* 1886. *No.* 2.

Before giving the history of this case Strümpell premises that he considers this disease to belong to the type variously named progressive muscular atrophy, progressive bulbar paralysis, amyotrophic lateral sclerosis, &c. The injurious influences acting on the motor cells and tracts vary and are not necessarily "specific" in the sense in which enteric fever is due to a specific enteric poison. The patient was a man aged 50 years, a cigar maker from his 12th year. He denied syphilitic infection and gave no family history of nervous disease. Up to his 25th year he considered himself a healthy man. At this time, after severe exposure while acting as member of a fire brigade, he noticed that his upper lids had fallen down, and that in looking sideways he had to turn his head more than formerly. Slowly and painlessly, without giddiness or diplopia, his trouble increased. His vision, at first normal, became weaker for near objects until he had to wear spectacles. For many years his condition had in no way altered, and he came to Strümpell only on account of a rheumatic affection of the knees.

There was marked double ptosis, the lids being only just 4 mm. apart with the utmost effort. The eyes were somewhat deep sunken, parallel, to all appearance normal, but almost perfectly motionless. Traces of movement downward and to each side alone remained. Pupils of medium size, or sometimes dilated, reacted well to light but not at all with accommodation.

R. w. H $\frac{1}{30}$ read $\frac{20}{70}$ and with + 8 Jaeger 2.
L. w. H $\frac{1}{50}$ read $\frac{20}{50}$ and with + 10 Jaeger 1.

There was therefore paralysis of accommodation. The visual fields, colour vision, and fundi were perfectly normal. Pharynx and larynx were unaffected. Sensation, special and general, was normal and there was no evidence of any visceral disease. The knee jerks were well marked and there was no indication of tabes.

Strümpell emphasises the affection of all the voluntary movements of the eyeball, including accommodation, the reflex contraction of the pupil being unaffected. The fact that the nuclear degeneration has come to a standstill is possibly not

final, but a parallel fact is that in many cases of progressive muscular atrophy the disease may remain for years confined to certain muscular groups of the upper extremities. The absence of diplopia is explained most probably by the fact that the disease attacks ganglion cells presiding over associated movements, and therefore the paralysis will always be an associated one. The fact is strongly against the peripheral origin of the disease. As to the cause of the affection no definite opinion could be given, but Strümpell suggests the possibility of his work as a cigar maker from his 12th year being the origin of it.

W. Uhthoff (Berlin). On the Diagnostic Value of Absence of Pupillary Reflex. *Berl. Klin. Wochenschr.*, 1886, *Nos.* 3, 4 (*Author's Abstract Neurol. Centralbl.*, 1886, *No.* 1).

Uhthoff commences his lecture by an account of the discovery of this symptom in 1869 by Argyll Robertson, and its subsequent investigation by Erb and others. He then describes his mode of testing the pupillary reflex, recommending that the patient be examined in a dark room, the light of a lamp towards which the patient looks being concentrated on each eye separately with a convex lens, the other eye being covered. He rightly warns against the fallacies of movements of the globes, of accommodation, and also of overlooking slight contraction of a narrow pupil. Notwithstanding the fact that the patient would not have a clear image of the lamp flame, it is more than doubtful if the above method would not tend to introduce the fallacy of accommodation, and it does not appear evident that the undoubted advantage of direct illumination of the macula is so great as to compensate for this probability. Slightly oblique illumination of an eye looking at a distant object seems distinctly preferable. It is scarcely necessary to confirm Uhthoff's objection to the method of testing the pupil reflex still sometimes used, which consists in making the patient suddenly open his previously closed lids.

Uhthoff in the first place states the results of an examination of 4,000 cases of mental disease by Moeli, Thomsen, and Siemerling. Among the 4,000 cases, absence of pupillary reflex occurred in 492, of whom 421 were general paralytics, *i.e.*, 85·5 per cent.; 21 had tabes, *i.e.*, 4·25 per cent.; 11 had

senile dementia, *i.e.*, 2·2 per cent.; 11 chronic alcoholism, *i.e.*, 2·2 per cent.; 9 syphilis, *i.e.*, 1·83 per cent.; 6 suffered from focal lesions, *i.e.*, 1·2 per cent.; 3 from head injuries without other cerebral symptoms, *i.e.*, 0·6 per cent.; and 10 cases from mental alienation or epilepsy, *i.e.*, 2 per cent. It is to be remembered that the 4,000 cases were all cases of mental affection, which explains the small number of cases suffering from tabes and from focal lesions. It is a noteworthy fact that on the one hand 85·5 per cent. of the 492 cases of reflex pupillary immobility were paralytics, and on the other that there were among them 11 cases of senile dementia. Uhthoff has not found that old age alone will produce reflex pupillary immobility, although it will, as is well known, cause narrowing of the pupil and very slight reaction to light. In the sphere of mental disease the symptom must be regarded as one of high diagnostic value, occurring in somewhat more than half the cases of general paralysis. Many of the above cases were observed over a long period of time.

In seeking to complete the clinical examination of this symptom, Uhthoff brought together three sets of observations. First, he examined several hundred healthy persons, and in not one did he find the pupillary reflex absent, agreeing in this observation with Erb. Second, he examined a large number of patients in various hospitals, with the result of finding that reflex pupillary immobility occurred only in cases of disease, which would naturally come to a clinic for nervous diseases. Lastly, he examined the patients attending Westphal's clinic for nervous diseases, to the number of 550, and those attending Schoeler's clinic for eye diseases, to the number of 12,000. He combines these last, with the following results:—

Among the 550 nerve cases and 12,000 eye cases, reflex pupillary immobility occurred 136 times (excluding cases of ophthalmoplegia interna, to be subsequently classified).

1. *Tabes*, 92 cases, 67·6 per cent. In 6 cases the diagnosis was not perfectly certain, and in 4 the light reaction was not completely absent. In 29 of the cases there was optic atrophy, in 15 ocular paralysis, in 5 paralysis of accommodation in one eye, in 12 marked difference in the size of the pupils (*i.e.*, in about one-fourth of the cases of tabes where it was accurately noted).

2. *General Paralysis*, 12 cases, 8 per cent. Complicated in 4 cases, with optic atrophy.

3. *Syphilis*, 11 cases, 8·1 per cent., including cases of cerebral syphilis and of syphilis without cerebral symptoms.

4. *Other Cerebral Diseases*, 8 cases, 5·8 per cent., including 2 cases of head injury with other ocular paralyses, 2 cases of cerebral tumour (1 with neuritis), 1 case of hydrocephalus, 1 of post neuritic atrophy, 1 of hemiplegia, and 1 of pachymeningitis.

5. *Multiple Sclerosis*, 2 cases, 1·4 per cent. The diagnosis in one case not absolutely certain.

6. *Railway Spine*, 2 cases, 1·4 per cent. The reaction in one case noted as very slight.

7. *Congenital*, 2 cases, 1·4 per cent. In both cases with rudimentary development of iris.

8. *Head Injury*, 1 case, 0·7 per cent., with strong alcoholic history; no other cerebral symptoms.

9. *Aneurysm of Innominate Artery*, 1 case, 0·7 per cent.

10. *Congenital Imbecility*, 1 case, 0·7 per cent., combined with retinitis pigmentosa and great concentric narrowing of visual field.

11. *Abuse of Tobacco*, 1 case, 0·7 per cent.

12. *Hystero-epilepsy*, 1 case, 0·7 per cent., with previous ocular paralysis and possibly a gross lesion.

13. *Right Hemianæsthesia*, 1 case, 0·7 per cent., combined with inequality of pupils; diagnosis still doubtful.

14. *Cause unknown*, 3 cases, 2·2 per cent.

In these two groups of patients, tabes is naturally a much more frequent cause of loss of pupillary reflex than is general paralysis. Among the 58 cases of tabes observed in Westphal's clinic, the light reaction was completely absent in 55·5 per cent., and was extremely feeble in a further proportion of cases, bringing the percentage up to 64. Erb finds it absent or extremely slight in 84·5 per cent. of cases of tabes. Paresis of accommodation was present only in 5·4 per cent., but contraction of the pupil with convergence was much oftener absent. The pupils differed in size in about one-fourth of the cases of tabes, much less often than in general paralysis. Of the 11 cases of syphilis, 8 had well-marked symptoms of cerebral syphilis. Of the other 3, two were children who had suffered

from hereditary syphilis; and the remaining case was of interest, in that the loss of pupillary reflex was, with the exception of loss of memory, &c., the single symptom remaining of past cerebral syphilis with paralysis of both third nerves. The fact that loss of pupillary reflex occurred in two cases of "Railway Spine" seems to Uhthoff to show that in some of these cases at least there is an anatomical change. Some of the remaining cases were not sufficiently long under observation for the diagnosis to be certain.

The above classification is exclusive of cases where the absence of pupillary reflex was combined with loss of accommodation—the ophthalmoplegia interna of Hutchinson. Of this condition 30 cases occurred.

1. *Syphilis*, 8 cases, *i.e.*, 23·3 per cent.; 6 unilateral, 2 bilateral.

2. *Tabes*, 3 cases, *i.e.*, 10 per cent.; 2 unilateral, 1 bilateral.

3. *General Paralysis*, 2 cases, *i.e.*, 6·6 per cent.; 1 unilateral, 1 bilateral.

4. *Injury*, 2 cases, *i.e.*, 6·6 per cent.; both unilateral and both with dislocation of lens.

5. *Severe Chill* (?), 1 case, *i.e.*, 3·3 per cent.; unilateral.

6. *Commencing Tubercular Meningitis*, 1 case; bilateral.

7. *Cerebral Tumour*, 1 case.

8. *Cause unknown*, 12 cases, *i.e.*, 40 per cent.; 7 bilateral, 5 unilateral.

Syphilis is evidently by far the most common cause of this affection; tabes and general paralysis but rarely producing it. In syphilitic cases it is almost invariably unilateral; and in one case where it was bilateral the second eye was affected years after the first. The history of syphilis, where it could be definitely obtained, dated back seven to eight years. In 40 per cent. of the cases there was no evident cause. These were chiefly young people, twenty to thirty years of age. The affection was generally bilateral and temporary, sometimes lasting only a day, but in one case permanent and stationary for twenty years, generally attacking both eyes at the same time, and accompanied by other nervous phenomena—points distinguishing these from the syphilitic cases. They naturally suggest some form of poisoning, but inquiry failed to substantiate this supposition.

Uhthoff states some exceptions to the rule that the sphincter paralysis and the failure of accommodation come on together. He also records a case of peculiar oscillatory contractions of the pupil in a patient with cerebral syphilis and loss of light reaction, these contractions being constant and independent of the illumination of the pupil. He closes with two cases of pupil affection, illustrating the physiological action of cocain, which should, he considers, be used in cases of difficult pupillary diagnosis.

The discussion on Uhthoff's paper added but little of moment. It dealt largely with a point not mentioned by Uhthoff, namely, the reaction of the pupil in cases of hemianopia according as the sensitive and insensitive halves of the retinæ are illuminated. The opinions expressed were undecided, and it is evident that the point requires more observation. All such observations will, however, be manifestly useless, unless an attempt is made to divide cases of hemianopia caused by lesion of an optic tract from cases produced by lesion in the occipital lobe or the fibres of Gratiolet. In speaking of the pupil reaction in hemianopia, Hirschberg referred to cases of transitory amaurosis in scarlet and enteric fever in children, stating that von Graefe had showed that the pupil in such cases reacted to light, and that the return of vision was practically certain in cases where life was preserved. Remak referred to the importance of the pupil reaction in cases of doubtful alcoholic neuritis simulating tabes.

A. Laurentjeff (St. Petersburg). **On Congenital Anomalies of the Iris.** *Centralbl. f. Prakt. Augenheilk, Jan.,* 1886, *p.* 10.

The author records two cases of congenital defects in the eye, and discusses them in connection with the previous literature of the subject.

Case 1.—*Complete congenital irideremia of both eyes with stellate cataract.*—The patient, aged 38, was a musician in a military band. The eyes were of normal size, the conjunctiva perfectly healthy; the cornea was oval in both, and presented throughout its whole periphery a diffuse opacity with, here and there, patches of greater intensity and definition; the curvature

of the right cornea was irregular, being flatter in the upper than in the lower half. Under focal illumination, and with the ophthalmoscope, the central area of the cornea was perfectly clear in both; no vestige was discoverable of the iris or of the ciliary processes in either eye. The lens was visible quite up to its margin; its nucleus was opaque, and there was an intense white opacity at the centre of the anterior capsule; beneath the anterior capsule and in the anterior fibre layers, radiating opacities spread outwards towards the equator; the periphery of the lens was clear.

There was no dread of light. When directed to a distant object the eyes were steady; movements towards the right or left were accompanied with horizontal nystagmus, while with upward or downward movements there was vertical nystagmus. The field was contracted in both eyes, especially above and to the inner side. Vision $\frac{8}{100}$ in each was not improved in either by any spherical or cylindrical glass; by the stenopaic slit it was raised to $\frac{10}{100}$ in the left. Jaeger's No. 6 was read at $2\frac{1}{2}$in., and the far point was apparently not removed by concave glasses; reading was possible only when the lines of the print stood very obliquely before the eyes. Neither the parents, the children, nor any other relative of the patient had suffered from bad eyes; he himself had learned to write at twelve years old, though with difficulty and only by looking very closely, as at present. He had always been healthy, and his eyes had never been inflamed.

Total congenital irideremia has, in the majority of cases, an hereditary tendency. Records of thirty cases published during the last thirty years were collected by the author; in nineteen of these the disease is stated to have been hereditary, in most of them several generations having been affected; in the present instance the disease was certainly congenital, but the evidence as to heredity was entirely negative. As in nearly all other cases of the same nature, both eyes were affected; congenital irideremia in one eye only has only been recorded twice.

The annular opacity, involving the periphery of the cornea, indicates an imperfect differentiation of sclera and cornea at an early period of intra-uterine life; by Wecker and Stellwag it is termed the fœtal ring; among the recorded cases it is noted eight times in one or both eyes, while in one case the cornea

was diffusely opaque throughout. The oval form of the cornea, another sign of imperfect development, is almost always present.

Opacities of the lens or its capsule almost always accompany congenital absence of the iris; in two only of the thirty cases recorded were the lenses perfectly clear. The opacities, especially those of the capsule, are usually present at birth; the opacities of the lens substance are mostly of the nuclear and polar varieties; stellate opacities are rare in this as in other congenital abnormalities of the lens.

With regard to accommodation, there are only eight well-recorded cases of irideremia in which this function was intact: in these cases the ciliary processes were clearly visible, and were seen to become thicker and to approach each other during accommodation; in all the other cases the ciliary processes appeared to be wanting, and in almost all there was nystagmus. In the present case no trace of the processes could be seen, the accommodation was completely absent, and the eyes oscillated.

All these abnormalities, including the opacity of the lens, must be referred to an imperfect development of the parts in question at an early period of intranteine life. The precise cause of the absence of the iris is not known. Manz believes it to be due to a too late separation of the lens from the anterior wall of the eye, whereby the growth and interposition of the iris between the two is prevented.

The fœtal ring of the cornea is the expression of an arrested development in this membrane. It appears in some cases to be useful in protecting the retina from the excessive influx of light which the absence of the iris would otherwise involve, for in those cases in which it is absent much dazzling is usually complained of; there are, however, cases on record in which there was no dazzling, though the cornea was perfectly clear.

Nystagmus is noted in sixteen of the thirty recorded cases of congenital irideremia, and almost always in association with absolute absence of accommodation; it is not present at birth, and must be regarded as dependent upon the imperfection of the retinal images.

Case 2.—Persistent Pupillary Membrane.—The defect was discovered during the examination of a young man doing

military service. On first inspection both eyes appeared healthy and quite alike. The pupils acted equally to light; the right eye had $V = \frac{20}{100}$, the left $V = \frac{20}{20}$; no glass improved the former. Focal illumination showed, in the right eye, a fine grey cord, ·5mm. thick, arising from the front surface of the iris in the neighbourhood of its ciliary zone, and growing thinner toward the centre of the pupil, where it was inserted into the lens capsule; almost in the centre of the capsule was a thin three-cornered membrane, to the upper outer angle of which the cord above named was attached; from the other two angles extremely thin cords passed in like manner to the anterior surface of the iris in such a manner as to divide the pupil into three sectors. The movements of the iris were performed in normal fashion behind these cords, which, when the pupil dilated, became visibly thinner, and drew outwards the angles of the three-cornered membrane; the membrane was evidently attached to the capsule only at its central point. The lens was elsewhere perfectly clear, and the fundus was normal. The patient had never suffered from inflammation of the eyes, and had only become aware of a difference between the two on his beginning military service.

The author concludes with a list of references to other records of persistent pupillary membrane.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, APRIL THE 8TH, 1886.

JONATHAN HUTCHINSON, F.R.S., President, in the Chair.

Reported by DAWSON WILLIAMS, M.D.

Death of Mr. Streatfeild.—The President referred to the loss sustained by the death of Mr. Streatfeild, who had been the treasurer of the Society since its foundation, and paid a high tribute to his moral qualities as well as to his surgical attainments.

Coloured Drawing by a Colour-blind Artist.—Mr. Edgar Browne showed a drawing made from a copy by a colour-blind man. He had omitted the red, and had substituted a rusty red for the green. The patient was unaware of his defect.

Persistent Pigmentation after Jaundice.—Dr. Seymour Taylor showed a patient who had had jaundice eighteen or nineteen years ago; the lower lids on both sides had been pigmented, but on the left side the pigmentation had disappeared; the lower lid was of a dark-green colour, and in the subconjunctival tissue of the lid there was a dark band of pigmentation, which did not affect the tarsal area.

The President had never seen a case where the pigment had the same slatey colour and the same distribution. The case was quite distinct from chromidrosis.

New Formation of Pigment on the Anterior Surface of the Iris.—Mr. Nettleship showed drawings and microscopical sections of four cases of pigment patches on the front of the iris. The new pigment had the same appearance as the natural uvea, with which, in a case examined microscopically, it was continuous. In this case the new pigment was everywhere covered by a thin but distinct colourless layer, varying in thickness, and often showing scattered round nuclei or corpuscles; this lamina was continuous with the altered anterior basement membrane of the normal iris; where the pigment was present, the proper tissue of the iris was atrophied. In all the cases previous iritis had occurred, and the colour of the rest of the iris was the same as that of the other eye.

Mr. Lawford showed a similar condition in a less advanced stage: the eye had undergone iridectomy for glaucoma.

Dr. Brailey thought Mr. Lawford's case fully explained by ectropion of the pigment of the posterior part of the iris, so common in advanced cases of glaucoma. By it the pigment was rolled forwards into view. He regarded Mr. Nettleship's cases, however, as of a different character, as the eyes appeared to be otherwise normal. The appearances in Mr. Nettleship's plate in the "Transactions," Vol. V., were not consistent with ectropion from glaucoma, but probably agree with those he showed on this occasion; if this were so, Mr. Lawford's case belonged to a different category.

Mr. Juler thought the pigment of the iris had come forward in the manner suggested by Dr. Brailey.

Mr. Lang said that where the pigment appeared in a circular band around the pupil, the iris was also everted, but that where the distribution of the pigment was irregular, there was no eversion of the sphincter.

Mr. Nettleship said that in one case of which he had specimens there was atrophy, but no curling up of the sphincter.

Staphyloma of the Choroid.—Mr. Lang showed a patient who had a large eyeball with increased tension, deep cup, and staphyloma of the choroid extending upwards and outwards. Vision was lost. There was some reason to suppose that the eye had been injured.

Relapsing Cyclitis.—The President related a case of relapsing cyclitis in a woman. The symptoms, at first, were apparently syphilitic ; there was iritis, with ciliary congestion, sores in the mucous membrane of the lip, and a dusky eruption. She had had a similar attack in the other eye two years before. The eruption had persisted for two years ; it bore a certain resemblance to chilblains, and was worse in winter. He thought that, in most cases of relapsing cyclitis, we had to do, not with syphilis, but with a condition in which there was a tendency to rheumatism, to gout, and to chilblains.

Pupillometer.—Mr. W. H. Jessop showed a new pupillometer constructed on the same principle as a wire-gauge.

Herpes Facialis Affecting the Eye.—Mr. Walter H. Jessop read a paper based on four cases. In the first case, the herpes followed the track of the external division of the supraorbital nerve ; the eye was affected with iritis, keratitis punctata, and increased tension : recovery, with perfect vision, occurred quickly. In the second, herpes along the lachrymal division of the ophthalmic nerve was followed by keratitis punctata and interstitialis. In the third, there was herpes along the frontal and lachrymal divisions of the ophthalmic nerve, early anæsthesia of the cornea, and superficial keratitis. In the fourth, the herpes followed the course of the infraorbital nerve, and there were phlyctenular ulcers on the cornea. It was pointed out that herpes facialis followed the distribution of the fifth nerve, and that, when the eye was involved, the branch affected was usually the ophthalmic, but sometimes the superior maxillary. The usual distribution was along the frontal, but there was no recorded instance of the nasal being the only branch affected, nor of the nasal and lachrymal branches being simultaneously attacked, while the frontal escaped. The fourth case was, he believed, the only recorded instance of the cornea

being affected in herpes infraorbitalis. Mr. Hutchinson had pointed out that the eye was affected if the oculo-nasal branch was attacked. The most common ocular complications were swelling of the lids, conjunctivitis, and increased lachrymation; the cornea might become affected by superficial ulceration, phlyctenulæ, interstitial keratitis, or keratitis punctata; neuro-paralytic keratitis has been recorded. Serous or plastic iritis might occur, and the pupil, though generally contracted, has been sometimes dilated. The chief affection of the fundus was papillitis. The tension had been generally described as lowered, though in many cases it was increased. Bowman, Hutchinson, and Vernon had recorded cases of palsy of the extrinsic ocular muscles, and paresis of the accommodation had also been noted. One sequel, persistent neuralgia, had attracted much attention; for its relief Bowman divided the nerves. The necropsies by Weidner, Wyre, Sattler, and Kaposi had demonstrated neuritis affecting the Gasserian ganglion and the branches of the ophthalmic nerve, and also dilatation of the branches of the ophthalmic artery. Most writers agreed that the affection was due to irritation of the sensory tract. Charcot suggested the posterior cornu as the seat in the cases of locomotor ataxy in which it occurred; the sensory ganglia and the nerves to their ultimate fibres had been found affected by neuritis. The small tract affected at first would suggest that a peripheral lesion often first occurred. As to anatomical distribution it was found that the nerves furthest apart, as, for instance, the lachrymal and nasal, were never affected together; also, that even small branches of the different nerves might be affected alone at first, with the exception of the nasal, which was never affected alone. Since the ocular structures were supplied by the nasal nerve it might be anticipated that the eye would suffer as a rule in herpes nasalis; the fact also that it was never affected alone would lead to the surmise that there is a greater lesion when it is affected. The writer thought that all the ocular symptoms except the very rarest could be explained on the supposition that a dilatation of the vessels due to irritation of the sensory nerves occurred; this seemed also to explain best the fact that even when a small branch of the supraorbital was affected the eye might suffer severely. Vascular dilatation lasting some time would especi-

ally influence such a structure as the eye. If the whole attack was due to the neurotic storm, the different nerves would be affected nearly simultaneously, and the ocular symptoms would be coincident with the cutaneous eruption, which was not the case. Mr. Jessop attributed to Mr. Hutchinson the credit of first separating herpes accompanying the ophthalmic division of the fifth nerve from erysipelas.

The President said that it was a mistake to suppose that herpes zoster did not occur in apparently healthy persons. His observation, to which reference had been made, was, that the severity of the disease was in proportion to the severity with which the tip of the nose was affected; and, if the disease occurred in the latter situation, the eye suffered. It was desirable to bear in mind that the true definition of zoster was a neuritis, often attended by skin disease; there were many cases where neuritis occurred and caused pain, but no skin lesion.

Hæmorrhagic Glaucoma Treated by Trephining.—Mr. Spencer Watson showed drawings from a case of hæmorrhagic glaucoma, in a man aged 64; the sclerotic was trephined, and the choroid was accidentally perforated: the tension became normal, and so remained for three months, but without any improvement in vision. The tension, however, again rose, so that the result was most unsatisfactory.

Dr. W. A. Brailey said that, in those cases where pain was severe and vision hopelessly lost, the best treatment was to stretch the supra-trochlear nerve.

Mr. McHardy thought the case showed conclusively that the operation of trephining was liable to fail entirely to relieve the distressing tension in these cases. He had been astonished by the ease with which the supra-trochlear nerve could be found in the living subject.

Mr. Edgar Browne had stretched the supra-trochlear in two cases without noticing any diminution in tension.

Mr. Spencer Watson said, in reply, that since the operation pain had not recurred. The operation, therefore, had not been without some good result.

Iritis Serosa occurring rapidly after Wound of Opposite Eye.—Mr. Edgar Browne: A gentleman was struck in the left eye by a branch; he travelled to Liverpool from Cumberland, and

when first seen the cornea was hazy, the iris was muddy, and in the anterior chamber was a thorn, which had wounded the periphery of the iris. The thorn was extracted next day, but the lens was already opaque on the surface, and the iris was covered with lymph; that night he had violent pain in the right eye, due to iritis. This iritis of the *right* eye fluctuated. and keratitis punctata appeared in both eyes, though the wound healed well. He eventually recovered, with good vision. Mr. Browne believed that the keratitis punctata was not due to the injury, but had arisen independently, or that the injury had, at the most, but a very indirect connection, setting up, perhaps, a trophic disturbance which determined the onset of an impending keratitis.

Central Guttate Choroiditis.—Mr. L. Werner: Read by the Secretary. "The infiltration vitreuse de la rétine et de la papille," described by Dr. Masselon, was, the writer maintained, the same disease as central guttate choroiditis. A drawing of the latter, published by Mr. Nettleship in the "Transactions," Vol. IV., showed a condition exactly resembling Dr. Masselon's drawings; the descriptions were practically identical, viz., small scattered dots of choroidal disease, apparently caused by deposit, equally distributed in both eyes, with retention of vision.

The President did not consider that the preservation of vision was a constant part of these cases, though the diminution of vision was not proportional to the amount of lesion.

Mr. Adams Frost quoted a case where vision was unaltered.

Mr. Juler referred to a case, previously recorded, where there was some disturbance of pigment, which supported the view that the affection was seated in the choroid.

Mr. Nettleship had recorded the cases referred to for the reason that vision was not affected, though the patches were numerous; as a rule, vision was affected. It was possible that the seat of the so-called colloid nodules might determine whether vision was affected. Where they occurred in the optic nerve, as was occasionally the case, vision was more liable to be affected, even though the number of nodules was small. He laid no claim to novelty in his paper; the honour of first describing the condition belonged to Messrs. Hutchinson and Waren Tay ("Ophthalmic Hospital Reports." 1875).

Mr. Waren Tay said this disease was not necessarily central. Now and then a case was observed in which similar spots were purely peripheral, without the vision being affected. The patients need not be senile, for precisely similar spots were seen in quite young people. In the first cases noted, vision was affected, but most observers had since seen cases where vision was unaffected.

The President had had an opportunity of comparing the condition noted in a drawing five years ago with the condition of the eye at the present time; there had been no alteration, and vision had slightly improved. Mr. Waren Tay had first called his attention to this condition in the out-patient room at the Moorfields Ophthalmic Hospital, and the paper in the "Ophthalmic Hospital Reports" was founded on these first cases.

Two Cases of Glaucoma treated successfully with Convex Lenses.—Mr. George E. Walker: Case 1.—A man, aged 33, in whom the left eye had been excised after two iridectomies for glaucoma. The right eye subsequently showed similar symptoms, and Mr. Walker ordered him to wear continuously 36in. spectacles, which neutralised his hypermetropia. When last seen, at the end of three months, vision was normal, and the eye free from pain. Case 2.—A man, aged 55, who, since childhood, had been liable to headache on attempting to read; in 1877, he began to have attacks of great pain in the eyes and head, with blindness. In 1883 he was told he had chronic glaucoma; iridectomy was done in the left eye, which speedily became blind. On October 28th, 1885, Mr. Walker found vision imperfect, the field narrowed, and tension increased. Vision was improved by a 20in. convex lens; after using this glass for a fortnight, pain had ceased, vision had improved, and the field had increased. He remained well up to the day of the meeting (162 days). On the previous day, Mr. Walker had introduced homatropine, in order to examine the fundus. He travelled to London, and on the following morning was found to be suffering from acute glaucoma. With rest in bed, and fomentation, he improved so rapidly that two hours before the meeting he was in a fair way of recovery. The patient said that the attack resembled previous attacks; and, though inopportune, it afforded an opportunity of proving that the previous attacks were of the same nature, though more severe. (Mr.

Walker informs us that this attack passed off rapidly and completely.) Mr. Walker maintained that these two cases, together with the previous one which had remained well since shown to the Society in 1884, afforded proof of his theory of glaucoma, and afforded corroborative evidence that the ciliary body was not merely an engine of accommodation. but also a pump, or lymph-heart, for the purpose of forcing waste fluid from the anterior chamber into the vein.

Perimeters.—Mr. Brudenell Carter showed two perimeters. The first was an improved form of his quadrant perimeter. The second was constructed upon the plan designed by Dr. Dyer, of Rhode Island, and described in the "Transactions of the American Ophthalmological Society," 1885. It consisted of a hollow hemisphere; the moving object was a small electric glow lamp, which travelled along a spiral track on the inner surface of the hemisphere. The chief advantage claimed was that by its use the field could be taken in two minutes.

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ON LATENCY IN CEREBRAL TUMOUR. A CASE OF RELAPSING NEURITIS.

By James Anderson, M.D., M.R.C.P.,

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Ella G., aged 17 years, a well-nourished and intelligent servant girl, of slightly pale but clear complexion, came to Moorfields Eye Hospital on 6th February, 1884, complaining of squint, double vision, and weakness of the lower limbs. She came under the care of Mr. Gunn, to whom I am indebted for the opportunity of observing and permission to record her case. She had entered service at the age of fourteen in good health, and having been previously in good health, with the exception of an illness in infancy, in which her step-mother states she had a fit and lost all her nails. After being in service about a year, she was one day found unconscious on the area steps, and remained so for about three-quarters of an hour. Nothing was noticed wrong with her eyes at this time, and she felt fairly well afterwards although not strong, until July, 1883, when she got very weak and ill, as if she had no strength in her lower limbs. This passed off, however, but one morning in October, 1883, on getting out of bed her left leg seemed to give way beneath her, and she fell down. She was not unconscious, went home that day to her stepmother, but so pale that everyone noticed it. She got again fairly well, the left leg remaining weak however, until 19th December, 1883, when in the morning she was very sick, and could not get up. She had no marked headache, but felt giddy and "strange about the eyes," could not bear the light, and partly lost the use of her right arm so that she could not take her meals. She entered Bromley Cottage Hospital in January, 1884, having now a convergent squint of the right eye, and a noise "like the singing of a bird" inside her head on the left side. Under the care of Dr. Herbert Ilott, to whom I am

indebted for a note regarding her condition at this time, she improved in general health, lost the sickness and noise in her head, and regained the use of her right arm, but as she still had diplopia and coloured vision Dr. Ilott sent her to Moorfields.

On examining her, I found almost complete paralysis of the right external rectus, paresis of the left external rectus. Corneæ clear. Pupils regular, 5 mm. each, acting to light and with accommodation.

V. R. $\frac{20}{50}$ $c+1=\frac{20}{20}$ partly; J 1 with difficulty.
L. $\frac{20}{20}$ $c+1=\frac{20}{20}$ better; J 1 easily.

Homonymous diplopia, the false image of a white object being red when held to her left, white when held to her right. There was double optic neuritis with moderate exudation, and a few small white spots external to each disc. She walked with a gait of weakness, no manifest difference between right and left lower limbs, although the left still felt weak, she said. Her right grasp was definitely weaker than her left, although she is right-handed. There was no defect of general sensation or of taste, smell, or hearing. There was no paralysis of the tongue or face, and no affection of speech. The knee jerks were completely absent to the most careful testing. There was no ankle clonus.

The enamel of her upper incisors was somewhat imperfect, but in no way characteristic of hereditary syphilis. Her father is sometimes "strange;" her mother died nine days after patient's birth, she had had no miscarriages; one sister is alive and in fair health; one brother died at nine months of "water in the head." There was no reason whatever to suspect acquired syphilis. Chest signs and urine were normal. Although slightly pale she could not be called anæmic, but her courses had been suppressed for six months. She never had any head injury, and lead poisoning could apparently be excluded.

She was ordered potass. iodid. gr. v., with syrup ferr. iodid ℳ. xxv. t.d.s., the potass. iodid. subsequently increased to gr. x., which quickly produced iodic acne. She continued to take the iodide till 26th April, 1884.

Improvement commenced at once both as to neuritis, ocular paralysis, and weakness of the left leg. In about three weeks the coloured image had disappeared, and the knee jerk

could be occasionally elicited. On 17th May, 1884, all symptoms except slight convergent strabismus of the right eye had disappeared, and she ceased to come to me after 7th August, 1884. Vision had been practically normal throughout, and when she ceased to attend, the discs showed only a very slight indefiniteness at their margins. The knee jerks were still difficult to elicit, but definitely present.

For over a year, *i.e.*, until 27th August, 1885, the patient continued well, having again entered service. On the morning of that day she felt ill. Vomiting, with left frontal headache, sore throat, and stiffness of left side of neck. On 7th September I examined her and found vision perfect, no paralysis, ocular or other, no neuritis, nothing pointing to intracranial disease except persistent headache. She was at this time under Dr. Ilott's care, and taking an iron mixture. On 16th November she began to have a "grating sound like two knives" in her left temporal region with severe headache, and on 29th November severe vomiting. Examining her on 1st December, I found again well-marked double optic neuritis, a pale exudation rising to + 4 D in the R. to + 3 D in the L. No hæmorrhages or gross retinal change. V. $\frac{15}{15}$ and J 1 with each eye, not easily. No fresh paralysis. H.D. of L. ear 4in., of R. $2\frac{1}{4}$ft., without obvious disease in middle or external ear. Knee jerks now well marked. No ankle clonus, no loss of general sensation. Urine normal. Menses regular.

Dr. Hughlings Jackson kindly admitted her on 2nd December under his care at the London Hospital, and I am indebted to him for allowing me to publish notes made during her stay there. She was prescribed a mixture containing sod. iodid. gr. x, and liq. arsenical. ℳ ii t.d.s., which she continued to take till she left the hospital. Listening over her cranium at the point in front of her left ear where she heard the grating noise, Dr. Jackson heard nothing, but two days later his house physician, Mr. Rawes, heard a bruit synchronous with the carotid pulse. The bruit was observed from day to day subsequently. It had a clanging character, was immediately stopped by pressure on the left carotid, and occasionally ceased spontaneously, the intervals of cessation becoming gradually longer. The patient was quite aware of

the cessation and re-commencement of the bruit, and also of changes in the character of the sound as heard by the auscultator. A similar sound was heard on the right side of the head but distant, and not apparently obliterated by pressure on the right carotid. The noise troubled her considerably till on December 25th it ceased entirely; the bruit as heard by the auscultator ceasing at the same time.

During her stay in hospital she had repeated attacks of headache and vomiting, the headache chiefly vertex and left frontal. She had also two pretty severe attacks of epistaxis; smell and taste were several times found less keen on the left than on the right side, and hearing was persistently so. Latterly she had a low booming tinnitus in the left ear with severe headache, both disappearing together on 17th January, from which date the patient expressed herself as quite well. She had never had any ear disease, and there was no objective evidence of it.

The optic neuritis subsided gradually, vision having been normal throughout, with the exception of an occasional "mist before her eyes," a slight defect of colour sense, and somewhat contracted visual fields. On February 5th I made the following note:—"L. disc slightly filled in, no physiological cup. Halo round disc specially up and in with slight blurring of details. No change visible in fundus. Vessels of normal size, no perivascular thickening. R. disc, fundi and vessels as on left side."

She left the hospital on February 7th, feeling in every respect quite well and with no evidence of intracranial disease; reflexes normal, and no loss of motion or sensation except that the vision of her right eye and the hearing of her left ear were not absolutely perfect, *i.e.*, she had V. of R. $\frac{15}{15}$ with difficulty, of L. $\frac{15}{15}$ easily, and H. D. of L. $1\frac{1}{2}$ft., as against $2\frac{1}{2}$ft. for R. ear. I have seen her since then, and with the exception of occasional slight headache, she has remained well.

This case illustrates the fact that optic neuritis arising from intracranial disease may run not only its early but its entire course without obvious affection of vision. This fact, important both as regards diagnosis and treatment, was sufficiently emphasised

in the discussion five years ago on the subject (Ophthal. Soc. Trans., Vol. I., p. 73), and is now, I presume, a well-recognised fact both to ophthalmic surgeons and physicians. There is not, however, the same unanimity regarding the inferences to be drawn from the recovery. Does the neuritis arising from intracranial tumour necessarily go on to atrophy, with more or less visual defect? Must a transitory recovering neuritis be explained, not by a tumour but by a meningitis arising apart from tumour? From the nature of the case we can rarely have *post mortem* evidence on the latter head, but the history just recorded bears on the point. The patient, when she first came under observation, presented the usual symptoms of an intracranial growth, and I considered myself justified in diagnosing her case as such. She recovered under treatment, and believed herself for over a year to be in perfect health. Then, without evident cause, she fell ill, in a fashion similar to her first illness. She again recovered, and is again in apparently perfect health. Am I to consider that she really is perfectly well? I must say I do not: I still believe that my first diagnosis was correct, and that there is the possibility, if not probability, of further developments in the case.

It is most probably due to oversight, but I have not happened to meet with a case of recurring neuritis in intracranial disease. Where the nerve has recovered there is apparently no reason why it should not inflame again. I may say also that I have recently observed a case where, a few weeks before death, well-marked neuritis appeared in a disc which I had seen pass into almost complete atrophy of non-neuritic type. In all cases of intracranial disease, therefore, it is well, as Dr. Hughlings Jackson has advised, to examine the fundi frequently and up to the end.

As to the precise value and meaning of the intracranial murmur which was so marked a feature in this

case I cannot at present express an opinion. I did not know the value of cranial auscultation until Dr. Jackson impressed it upon me in relation to the present case. Since then I have met with several instances of intracranial murmur, both with and without cerebral tumour. There can be no doubt that in a considerable proportion of cases in which complaint is made of noises in the head, such noises can objectively be heard.

I am in much the same position with regard to the temporary disappearance of the knee jerks. I believe they may be absent in cases of intracranial tumour without obvious disease of the lumbar region of the cord. On the other hand, in two cases of cerebral tumour in which the knee jerks were absent, I found disease in the lumbar region, a gumma involving the anterior nerve roots and malignant infiltration of the lumbar meninges.

The following case presents many points of similarity with the preceding. I shall relate it without comment, except that I am sorry I did not auscultate the cranium. But to remind how differently such cases may end let me mention, in the first place, the case of a young lady, aged 18, who, in November, 1884, was suffering from headache and pain in her eyes, with a golden ring round objects at which she looked. She was found to have double optic neuritis, which during the next two months increased in severity and was accompanied by vomiting. In January she had a convulsive fit with loss of speech, and three days later she died suddenly. Although not verified *post mortem*, I have not the least doubt that she died from cerebral hæmorrhage, due to rupture of a tumour, most probably gliomatous.

Gertrude P., aged 18 years, milliner, came to me at Victoria Park Hospital on September 7th, 1885, complaining of headache, vomiting, and noises in her ears. She had had attacks of

headache for twelve months, seated chiefly in the right temple, with a singing noise in her right ear, which she could relieve by pressing on her carotid artery. During the previous three months the pain had been extremely severe, and for a month she had had repeated attacks of vomiting. For three days the pain, vomiting, and tinnitus in both ears had prevented sleep, and she was pale, thin, and exhausted. Examining her eyes I found well-marked double optic neuritis, the swelling more marked in the right than the left disc ; no hæmorrhages or white spots in the fundi.

She was admitted the following day under the care of Dr. Hughlings Jackson at the London Hospital, who kindly allows me to use the notes of her case. The acuteness of the headache quickly passed off, as it had done in previous less severe attacks. There was no paralysis or abnormality of sensation. Reflexes were normal. She had never had a fit. Chest signs were negative ; urine normal. Catamenia fairly regular. Both red corpuscles and hæmoglobin deficient. She was anæmic but not markedly so. In infancy she had had otorrhœa, but since two years of age it had given her no trouble, and after the first day her hearing was normal. Her family history negatived the possibility of hereditary syphilis, and there was no reason to suspect acquired taint. She was prescribed sod. iodid. gr. x to xv., t.d.s., and the inunction of ung. hydrarg. ʒ½ b.d. The neuritis speedily began to subside. The headache and vomiting returned occasionally in hospital but finally ceased, and on November 6th, that is two months from admission, she was discharged apparently well. Vision had been throughout good. The edges of the discs remained somewhat blurred.

I have seen her from time to time since her discharge, and on May 5th I made the following note :—" R. margin of disc slightly blurred. Physiological cup ill-marked. Vessels of normal size ; very finely obscured as they pass beyond the edge of the disc. L. as above, but an artery passing down and in is definitely obscured for a short distance, the sole remnant incompatible with normal appearances. Vision perfect. General health excellent, with the exception of post-nasal catarrh."

WURDINGER (Munich). Experimental and Anatomical Researches on the Action of Cocaine on the Cornea. *Klin. Monatsbl. f. Augenheilk., April,* 1886, *p.* 14.

The author directed his attention, in the first instance, to the peculiar changes in the corneal epithelium, which have been many times observed at the moment of operating, after the free use of cocaine. He made a series of experiments on rabbits, dogs, and guinea pigs.

A few drops of a five per cent. solution were applied to both eyes at intervals of four minutes ; one eye remained open, the other was closed immediately after each application. The exposed cornea began to show superficial changes at the end of the first three or four minutes, and after twenty to twenty-five minutes its whole surface presented a rough but glistening bluish appearance, with depressions which resembled loss of epithelium, but which, even where deepest, were not actually raw. The cocaine solution when dropped upon this surface rolled over it as over a greasy surface. At the end of an hour the opacity was so considerable that the iris was no longer distinctly visible. In the closed eye, on the contrary, the cornea remained smooth, bright, and transparent. This proved that closure of the lid has an important influence on the changes in question.

Further experiments showed that the intensity of the corneal changes depended less upon the frequency of the application or the concentration of the solution, than upon the duration of the whole experiment. A frequent application of distilled water or of lachrymal secretion alternately with the cocaine did not remove such changes as had already occurred, but it hindered their further increase. This appeared to show that the changes in question were due to a drying process in the surface of the cornea.

In order to study the connection of this dryness with the visible conjunctival anæmia and the diminished lymph-supply to the corneal parenchyma, the author made use of the fluorescine method employed by Ulrich, Pflüger, Ehrlich, and others (see O. R., Vol. III., p. 89). One eye only of the animal was treated with cocaine, and the application was continued until the roughness of the cornea was produced ; both eyes were then treated for ten minutes, at intervals of one minute, with a few

drops of the fluorescine solution. In the eye not under cocaine the fluorescence appeared only in the anterior layers of the cornea, in slight degree and quite evenly throughout; in the cocaine eye, on the other hand, the colour appeared in the deepest parts, spreading thence and becoming very intense throughout the parenchyma. Similar experiments were made with a saturated solution of methyl-blue.

In a further experiment, scratches were made in the corneal epithelium of both eyes with a needle, and the methyl-blue then applied as before. In the cocaine eye almost the whole of the corneal substance became stained, apparently through the defect in the epithelium, where the colouration was the most intense. In the eye not under cocaine staining only occurred at the parts where the epithelium was defective. From these results the author infers that the epithelium and parenchyma of the cornea receive a greatly diminished lymph-supply when under the influence of cocaine.

Microscopical examination of the corneas thus experimented on showed that the unevenness of the surface was due to an irregular diminution of the thickness of the tissues. During the early stages the epithelium remains entire; its anterior layers then become thinned and flattened; a little later the deeper layers begin to shrink, and ultimately the external cells are, in places, cast off at the spots where the epithelium is most damaged. The shrinking of the true corneal substance is so considerable as to produce depressions in its hinder surface.

To the condition thus produced the author applies the name xerosis of the cornea; it is caused by diminution in the lymph supply, supplemented by evaporation.

It is noteworthy that the same changes in the cornea may be produced without direct contact, viz., by subcutaneous injection, of the cocaine solution. This overthrows the idea that the epithelial disturbance might be due to the presence of free acid in the solution.

Finally, the experimenter ascertained that weak solutions of corrosive sublimate, borax, boracic acid, or even common salt, which in a normal eye produced no mischief of any kind, were apt, in eyes which had been energetically treated with cocaine, to cause a more or less intense opacity in the cornea—the striate keratitis which has been noticed in cataract operations

performed under these conditions. Infiltrations of the cornea occurring after operations on rabbits' eyes treated with cocaine presented a higher degree of the morbid process than in eyes to which no cocaine had been used. The difference is probably due to greater permeability of the epithelium and poverty of lymph in the corneal substance, by reason of which secretions from the conjunctiva pass more readily into the tissues.

On the evidence afforded by these experiments, the author advises that the use of sublimate solution should precede the application of the cocaine by half an hour or more, and that after each use of the cocaine solution the eye-lids should be closed, and covered with a moist dressing until the moment of operation.

Carl Laker (Vienna). An Experimental Study of the Cupped Disc of Glaucoma. *Klin. Monatsbl. f. Augenheilk, May, 1886, p. 187.*

These experiments were undertaken at the suggestion of Dr. Purtscher, of Klagenfurt. Purtscher's idea was, setting aside all preconceptions and disregarding the question of trophic and pathological tissue-changes, to study the mechanical effects of increased pressure on the papilla of the normal eye. Taking an indiarubber balloon, the wall of which was at one spot weaker than elsewhere, he found that on distending it by high pressure, the thin area was moderately protruded beyond the rest, and that under certain conditions a reduction of the pressure caused, together with a general shrinking of the balloon, an *increased* protrusion of the weak area, a result indicating that the elastic contraction of the membrane within this area was more than neutralised by the elastic contraction of the ring immediately surrounding it. On the supposition that the scleral ring enclosing the papilla has considerable elasticity, while the lamina cribrosa is more distensible but less elastic, he conceived it possible that similar alterations in the intraocular pressure might cause corresponding changes in the papilla.

Dr. Laker undertook to investigate the question experimentally in the Physiological Institute of Graz. The questions proposed for solution were :—(1), Is an abnormally high intra-

ocular pressure able of itself to excavate the papilla of the healthy eye? (2), Can the reduction of such abnormally high pressure under any circumstances deepen an already existing excavation, or even induce such.

In spite of the apparent paradox contained in the second question, the answer is not so certain as it would seem. The mechanical effects of raised intraocular pressure on the parts in question obviously depend on the existing differences in the elasticity and distensibility of the sclera on the one hand, and the tissues lying within the scleral ring on the other. Supposing the extreme case that sclera and lamina were equally elastic and extensible, or, the other extreme, that both were alike absolutely rigid, an excavation of the lamina could not occur under any variations of pressure. The actual conditions lie, of course, between these extremes. So long as an excess of pressure does not stretch either tissue beyond its power of elastic recoil, a fall of pressure cannot cause an excavation to become deeper. It is possible, however, that under certain high degrees of pressure the lamina may be over distended, while the elasticity of the scleral ring remains unimpaired; a fall of pressure, while it permits the scleral ring to contract, may then leave the lamina distended more than before. This explanation is given merely to show that the effect imagined on theoretical grounds is within the limits of possibility.

Believing that experiments upon the eyes of animals were inapplicable to the question, Laker had recourse to those of the human subject removed shortly after death. The desired degrees of intraocular pressure were produced by introducing a canula into the globe, and connecting it with a column of water and a manometer. The fluid employed was a 0·6 per cent. solution of chloride of sodium, with a trace of perchloride of mercury. After the required pressure had been maintained during a given period, the fluid in the injection tubes was gradually replaced by alcohol, and the globes were surrounded externally with Müller's fluid. By this means the changes produced in the papilla, if any, were fixed by hardening the tissues during the continuance of the pressure. Then after lying some days in alcohol the region of the papilla was placed in the microtome, and cut into sections parallel with the long axis of the nerve. For the determination of the first question (see

above) two pairs of eyes were examined. One eye of each pair was subjected during about forty-eight hours to an internal pressure of 130 mm. hg., the other to a pressure of 25 mm. hg. Microscopical examination carried out in the way already described showed a marked difference between the two. In each case the eye subjected to high pressure presented a decided displacement of the lamina cribrosa in the direction backwards and completely up to the scleral ring. The difference was sufficiently great to be visible in the sections to the unaided eye. The author gives drawings made from his preparations, in which the displacement of the lamina cribrosa is well seen. He promises fuller details when a larger number of eyes have been examined.

It will be noted that the amount of pressure employed was very high. Laker, indeed, assumes that so high a pressure never occurs in the living eye even in extreme glaucoma. This, we think, is too much to say; in the eye of the cat, during compression of the aorta and simultaneous irritation of the fifth nerve, Von Hippel and Gruenhagen found a pressure of 200 mm. hg., and our own experiments with the tonometer appeared to show that in some cases of glaucoma the intraocular pressure is *at least* equal to 100 mm. hg. ("Glaucoma: Its Causes, &c." London: Churchill, 1879, pp. 100, 103, 280.) In any case it is of much interest to have an absolute proof from Laker's experiments that a displacement of the lamina cribrosa resembling that which is found very early in glaucoma (*see* Brailey, R.L.O.H. Reports, Vol. ix, p. 208) can be produced by purely mechanical means.

Five pairs of eyes were experimented on with regard to the second question. Both eyes were subjected to high pressure for forty-eight hours. In one the pressure was then very gradually reduced, until on the third day it had fallen to the normal, *i.e.*, 25 mm. hg. Both eyes were then hardened and examined as before. In every case the lamina cribrosa was displaced backwards, but the difference between the two eyes of each pair was too slight to justify a conclusion. In two cases the eye, hardened under a reduced pressure, appeared to have the deeper excavation of the two; but in the author's opinion many more experiments would be required in order to give a definite answer as to the truth of Purtscher's idea.

M. LANDESBERG (New York). Glaucoma. *Centralbl. F. Prakt. Augenheilk., April*, 1886, *p.* 109.

Adverting in the first instance to the well-known fact that an iridectomy on a glaucomatous eye is speedily followed in a certain percentage of cases by an outbreak of acute glaucoma in the fellow eye, the author relates a series of five cases from his own practice, in which the sequence of events was of a contrary kind; a successful iridectomy upon the primarily affected eye was followed, in the fellow eye, by a disappearance of previously noted premonitory symptoms, and a permanent return to health. He finds no similar cases on record, and his enquiries of other oculists met with only negative replies.

Case 1.—A woman, aged 53. *Right*, typical glaucoma. *Left*, EM.V. $= \frac{15}{20}$. Pupil sluggish, and rather large; anterior chamber shallow; spontaneous arterial pulse, and considerable venous hyperæmia in the retina; light-sense diminished at periphery. T increased. Iridescent vision, mistiness, and ciliary neuralgia had begun seven months before and become more frequent lately.

During convalesence from a successful iridectomy on the right eye, the symptoms disappeared from the left. At the time of discharge the left eye had T normal; pupil, anterior chamber, and field normal; V $= \frac{15}{15}$; no arterial pulsation even on pressure, and no retinal hyperæmia. The patient remained under notice for eight years, and the eye continued free from glaucoma symptoms.

Case 2.—A woman, aged 49. *Right*: Typical acute glaucoma. *Left*: T $+ 1$; pupil sluggish, slightly enlarged; anterior chamber shallow; cornea slightly hazy; light-sense diminished at the periphery; a feeling of pressure in the eye. These symptoms were very recent, though coloured rings had been seen a month or more.

Iridectomy was done in the right, with the intention of doing the same to the left the next day, but as the latter at once began to improve it was not touched; forty-eight hours after the iridectomy on the right the left was normal in all respects. During eight years following, it showed not the slightest symptom of glaucoma.

Case 3.—A man, aged 53. *Right*: Subacute glaucoma. *Left*: M $\frac{1}{9}$; V$=\frac{15}{30}$; Tension increased; pupil sluggish; venous hyperæmia in the fundus, with tortuosity of the vessels; subjective warnings, similar to those previously noticed in the right eye.

After iridectomy on the right the left recovered completely. At the time of discharge it had a normal pupil and tension, and no hyperæmia of the fundus. The patient remained under observation for five years, and had no further glaucoma symptoms.

Case 4.—A woman, aged 47. No symptoms of eye mischief until about fifteen hours before she came under examination. Excessive mental excitement appeared to have induced the attack. *Left*: Acute glaucoma, with severe irritative symptoms. *Right:* T$+1$; pupil dilated and sluggish; ciliary injection; corneal haze; fundus veiled and hyperæmic; arterial pulse on slight pressure; vision cloudy.

Iridectomy was performed on the left eye only. Twenty-fours after the operation the right showed no trace of disease and could see as well as ever before. Observations lasting over five years showed no return of the symptoms.

Case 5.—A woman, aged 58. *Right*: Sub-acute glaucoma. *Left*: Tension increased: pupil sluggish; venous hyperæmia in the fundus; periodical clouds before the sight, coloured circles and photopsiæ.

Iridectomy was performed on the right; the left speedily recovered, and was at the time of discharge entirely free from glaucoma symptoms. Thirteen months later the right eye was again attacked, and the left showed premonitory symptoms; a sclerotomy on the right relieved the recurrent attack, and the left speedily returned to the normal state. It was still perfectly healthy five years later.

T. R. Pooley (New York). On the Relation of Uterine Disease to Asthenopia and other Affections of the Eye. *New York Medical Journal, Feb.*, 1886, *p.* 179.

After referring briefly to some of the recent writings which deal with this subject, the author records a series of observations of his own. In order to ascertain the frequency with which

disturbances of vision have been noticed by those who see a large number of uterine cases he addressed a note to several specialists, one of whom, Dr. J. B. Hunter, wrote as follows:—"It would take some time to hunt up and sort out cases, so I will simply state the fact that I have in many cases been so accustomed to hear the eyes complained of where there was chronic uterine disease, that I believe there is no doubt as to the connection between the two ailments. In bad cases of lacerated cervix uteri, where there is much dense cicatricial tissue, patients commonly complain of 'weakness' of the eyes, that they tire easily in reading or writing, and often ache. These symptoms I have often known to disappear within a few months after operation for the cure of the lacerated or indurated cervix. I have seen the same symptoms in cases of chronic retroflexion, and in other affections of the uterus accompanied by congestion. The reason why I have considered the disease of the eyes sympathetic is that such disease has again and again passed away, without direct treatment, on curing the uterine disease. Pain in the top of the head is one of the commonest symptoms in uterine disease, and vertical headache is often accompanied by either pain or weakness in the eye."

The author gives, with some detail, records of twenty cases illustrating the connection above named, and concludes his paper with the following summary of the facts which they appear to teach :—

1. In certain cases there is a direct relation between irregularities in function and diseases of the uterus and concomitant affections of the eye.

2. The eye affection may be merely functional, which is the commoner (asthenopia), or there may be organic disease.

3. Asthenopia exists in cases where there is no ametropia, apparently due only to the reflex effects of the uterine disturbance on the organs of vision.

4. In many of these cases there is paresis of accommodation.

5. In other cases of asthenopia in which ametropia is present, and the existence of uterine disease as well, the former is not always relieved by the correcting glasses.

6. Other functional anomalies than asthenopia may be observed, such as blepharospasm, diplopia, and functional irritation of the retina.

7. Long-continued reflex irritation from uterine disease may result not only in asthenopia, but, as already shown by Mooren, in atrophy of the optic nerve, and other organic changes.

8. Irregularity of circulation and venous hyperæmia about the climacteric period may be the cause of intra-ocular hæmorrhages.

9. Loss of blood from uterine hæmorrhage affects the nutrition of the optic nerve and retina, leading to dangerous results.

10. A variety of pathological conditions of the uterus may be responsible for the eye troubles, but they occur more often where the disease is of a chronic nature, as in displacements, lacerations of the cervix, and other affections accompanied by congestion, and where the nature of the disease is such as to affect the normal process of menstruation.

11. The proper therapeutic measures to be adopted in such cases are: The rational treatment of the uterine disease; the correction of any existing ametropia; the temporary use of weak convex glasses when there is feebleness of accommodation. In some instances galvanism for the relief of supra-orbital neuralgia, and the use of tonics, proper food, and favourable hygienic conditions.

In some of the cases recorded in this paper the dependence of the eye trouble upon the uterine trouble is assumed upon slight evidence; thus, for example, it is shown that an accommodative asthenopia not due to hypermetropia and not relieved by lenses was associated with chronic uterine troubles. The dependence of the one upon the other may, and indeed should, be strongly suspected in such a case, but it can only be considered as established when the cure of the uterine disorder is found to cure the ocular disorder. From among the cases in question we select the following as among the most conclusive:—

Case 7.—Married, aged thirty-four; one child about fourteen years old. Complains of asthenopia, which gives her very much annoyance in the least attempt to use her eyes. Em. V.

$\frac{20}{20}$, but accommodation feeble. Gave her + 40 to read with, which to some extent relieve the distress. Uterine disease since birth of child, dysmenorrhœa, and occasional hæmorrhages. Is diagnosed by her family physician as laceration of the cervix. Operation for its cure made the eyes better, but a recurrence of the symptoms of the uterine trouble made the eyes worse too. She now consulted Dr. Thomas, who found fungosities of the uterus, which he removed by the curette; since then, a number of years, she has had neither uterine disturbance nor asthenopia; menstruation normal and painless. Moreover, since the cure of her uterine affection she has laid aside her glasses.

Case 8.—This patient showed some of the symptoms of Graves's disease, although most of the symptoms were no doubt directly due to disturbance of uterine function. She is thirty years of age, married; was confined four months ago; since then has been increasing rapidly in flesh, and about this time her eyes began to protrude. When examined by me there was slight exophthalmos, more marked in the left eye. Vision Em. S. $\frac{20}{20}$. Required + 1 D. to read Sn. $1\frac{1}{2}$ in 8″. Ophthalmoscopic examination shows some hyperæmia of both discs. Dr. Frothingham, her attending physician, wrote me that the patient was suffering from hypertrophy of the uterus, due to arrest or retardation of the process of subinvolution. She was given + 36 to read with, which relieved the fatigue of the eyes. Under the care of her physician she gradually became quite well again, gave up the use of her glasses entirely, and the exophthalmos disappeared. I saw this lady about a year after she first came to me about her eyes; she had lost much of her obesity and looked the picture of health.

Case 15.—The particulars of the following case were supplied by Dr. Townshend, who has for a long time been interested in the subject:—Miss C. came under my care last July. She had been under treatment for nearly a year by the surgeon who sent her to me while he was out of town. She had a retroflexed uterus, with the ovaries held down behind it, and up to that time it had been impossible to raise either. Pain at the time of menstruation was great, she having to remain in bed during the entire time. All the while, and especially at her menstrual periods, any continuous exertion of

her eyes caused pain in them, with frontal neuralgia, and very slight use at sewing or reading caused blurring of everything she looked at—so much so that she had to desist almost entirely from fine work. An oculist's report showed no organic defect of vision, but weakness of accommodation. By diligent effort, the uterus was replaced, the ovaries following, and a pessary placed, which holds the uterus perfectly. Her condition now is one of wonderful improvement since July; general health very good; pain at menstruation slight as compared with formerly, and the former eye troubles have entirely disappeared.

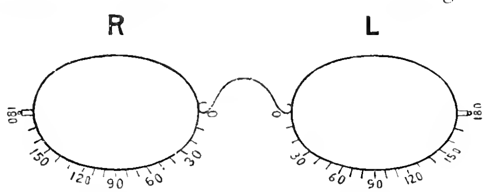
Case 16.—A still more remarkable case, in which there was serious impairment of vision, instantly improved after an operation for the relief of uterine trouble depending upon lacerated cervix, is also given by Dr. Townshend:—Mrs. A. came to me in June, 1883, having had a lacerated cervix uteri for six years: not pregnant since. The apparent laceration was not very great, but in either angle could be felt large deposits of cicatricial tissue. She complained of almost constant pain, especially referable to the back of the head, with great indistinctness of vision, being able to work but a very short time at anything which required good vision. This had been increasing for a year. She also could not distinguish small objects at a distance formerly easily seen. This was especially noticed by the fact that she could not see the time by a clock in her bedroom as she lay in bed, which her husband could readily do, and as she formerly could herself. There was no organic disease of the eyes. Operation for lacerated cervix June 10th, 1883, removing carefully all hardened tissue from the angles. Result perfect. (June 20th, menstruated. July 1st, pregnant. Confined the following April.) From the moment she came out of the ether the errors of vision were gone. She could, while lying in bed, see the time by the clock, which she had previously been unable to do, which led her to call out, in glad surprise, the fact to her nurse. The asthenopia and headaches disappeared. This improvement lasted till after her confinement, following which there was again a medium degree of laceration of the cervix, as a result of which, about six months after the labour, she again began to complain of a recurrence of the former eye symptoms, with a dimness of

vision which made her think her room imperfectly lighted. The operation was repeated, under the influence of morphine, without ether. An hour after the operation all dimness of vision had disappeared.

Case 17.—Single, thirty-seven years old; asthenopia; eyes emmetropic and normal; V. $\frac{20}{20}$, but they tire upon the least use of them. She suffers from painful and irregular menstruation. In reference to this condition Dr. C. S. Ward wrote me that she had fungosities of the uterus, and operation for their removal by the curette resulted not only in a cure of the dysmenorrhœa, but entire relief of the asthenopia as well.

STAMP FOR RECORDING CYLINDRICAL LENSES.

Mr. Simeon Snell forwards to us the following illustration



of a stamp used by him in ordering spectacles, and in making records in the case-book. It is made by Mr. Godley, of Eyre Street, Sheffield, and may be had as a loose hand stamp or as a self-inking stamp, working with a spring.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, MAY 6TH, 1886.

JONATHAN HUTCHINSON, F.R.S., President, in the Chair.

Reported by DAWSON WILLIAMS, M.D.

Exophthalmic Goître.—The President said that the evening was to be devoted to a discussion of exophthalmic goître. It was desired that facts for future analysis rather than theories should be brought together. A point of importance which an

accumulation of facts might elucidate was the prognosis of the disease. As an example of recovery he mentioned the case of a medical man published by Dr. Warburton Begbie ten years ago. At that time the patient had a rapid pulse, bronchocele, proptosis, and albuminuria. Mr. Hutchinson had seen this gentleman on the day of the meeting; he had lost all these symptoms; the carotids still pulsated vigorously, the thyroid was full, the pulse was intermittent and easily accelerated, yet the patient was in excellent health, and had been able to continue his practice up to the present time. With regard to the influence of treatment in this case, the chief good appeared to have occurred during a sea voyage, and the patient himself thought that, during this voyage, doses of twenty grains of bromide of potassium, three times a day, had been of great use. The coincidence of albuminuria and Graves' disease deserved attention. Dr. Begbie had recorded a case in which albuminuria had been persistently present at some parts of the day, that is, after meals, and especially after breakfast, for one year. This patient also recovered. The presence of albuminuria, in both these cases, had been confirmed by Dr. George Johnson. Mr. Hutchinson felt uncertainty as to the influence of remedies; his experience had been fragmentary and special, the cases having come under treatment on account of proptosis. He thought that many of these cases had recovered. Digitalis, aconite, iron, and bromide of potassium seemed to be of use in different cases. In one middle-aged lady, tincture of aconite, long continued and pushed to ♏xx, three or four times a day, was said to have been followed by complete cure. With regard to the eye-symptoms (severe symptoms were rare), the treatment which produced the best results was the systematic application of ice to the forehead, eyes, and temples. Blindness had never been produced in any patient under his care. The apparent connection between impaired menstrual functions and the disease was generally acknowledged. Its occurrence in young men, in unmarried women, and the fact that it never occurred in pregnant women, appeared to prove some connection between the sexual functions and exophthalmia. He did not think that the disturbance of the menstrual functions produced the disease, but rather that both affections were the consequences of a

common cause. He had only met with one case in which the disease occurred during pregnancy; in that case, the proptosis began at the fifth month, but the patient did not suffer severely in general health, although she suckled the child for a year. The statistics recorded with reference to sex and to age were interpreted by Dr. Niemeyer as proving that the men who were affected were old; von Graefe stated that the disease was more liable to be fatal in men. Mr. Hutchinson, however, had never seen a case in a man which began after middle age.

Dr. Bristowe had no statistics to give, but would place before the Society a group of interesting cases, together with two or three additional facts. In a recent case, in a woman aged 40, the symptoms of Graves' disease were distinctly referable to prolonged exposure to cold. In another, recovery appeared to be complete. In another, all signs of proptosis and enlarged thyroid having subsided, the patient still suffered at times from severe palpitation. He referred also to a case of the disease in which exophthalmos was associated with syphilis; and to one in which the patient died under his care, from organic heart disease. The cases of chief interest were three in number. The first was that (*vide* Brain) of a young woman, who, about the year 1877, first showed signs of proptosis, enlarged thyroid, and palpitation, which after a few years became complicated with ophthalmoplegia externa. In 1882 she came under Dr. Bristowe's care, suffering from nearly complete paralysis of all the external ocular muscles, ptosis, and proptosis; complete hemianæsthesia on the right side, with colour-blindness, and loss of taste and smell on the same side. Later, fits, apparently epileptic, supervened, with rigid paralysis of the right arm and leg. Also, she suffered from hæmorrhage from the ears. She was under Dr. Bristowe's care for two years. The thyroid was not visibly enlarged. She had no palpitation, but her temperature, from first to last, varied daily between 100° and 103°, 104° or 105°. Finally, she died of an acute attack of bronchitis. At the necropsy, no disease was discovered in the nervous centres; the thyroid was a little larger than normal; there was much fat in the orbit, and the ocular muscles were pale. Excepting for the prominence of the eyeballs, the patient appeared, so far as the signs of Graves' disease are concerned, to have recovered.

The second case was that of a young married woman, who had suffered for three or four years with Graves' disease, and in which the thyroid had become so large as latterly to cause attacks of severe dyspnœa. On this account she came into hospital. Her breathing was stridulous; but no immediate danger being anticipated, no immediate operative procedure was contemplated. A day or two after admission, she was attacked with a severe paroxysm of dyspnœa, and, before anything could be done, died. The third case was that of a young woman, who had been suffering from the usual symptoms for some years, but who was also the subject of serious organic heart disease; aortic, mitral, and tricuspid affection. On admission, her breathing was stridulous; and, having regard to the result of the case last narrated, Dr. Bristowe consulted with his colleague, Mr. Sydney Jones, as to whether any operation was feasible. The goître was unusually large, but fortunately the isthmus was narrow; it was determined to remove a portion of the isthmus, and dissever the two lateral lobes—an operation which Mr. Jones had performed with admirable results, in a case of ordinary goître, of Dr. Bristowe's, in which suffocation threatened. The operation was successfully completed in this case, and was followed by dwindling of the lateral lobe of the thyroid body, and cessation of stridor. No other definite improvement followed. The prominence of the eyeballs continued, and the cardiac symptoms unfortunately progressed unfavourably, so that, at the end of about four months, the patient died of the heart disease.

Dr. Wilks (paper read by the Secretary) stated that of the many cases which he had seen some had recovered, others had died, and others had been lost sight of. He had seen slight cases, which were probably modifications of the complaint. He considered that the leading symptoms were increased frequency of the heart's action, enlarged thyroid, prominent eyeballs, a loud murmur heard in the veins with a corresponding palpable thrill, and, in severe cases, great emaciation, with outbursts of sweating and diarrhœa. The increase in the cardiac rapidity he regarded as the primary and necessary symptom. Quickened cardiac action, combined with exophthalmos and emaciation, or with enlarged thyroid and

emaciation, he regarded as the characteristic symptoms which justify a diagnosis. The theory which attributes the symptoms to disease of the sympathetic in the neck had not been found true in fact, though there was probably some disturbance of the sympathetic, giving rise to the extreme relaxation of the blood-vessels, and to murmurs which were much louder and harsher than any met with in simple anæmia; the diarrhœa and sweating might also be due to the sympathetic disturbance. Apart from the proptosis and enlarged thyroid, which could not come on suddenly, the symptoms resembled those seen in nervous women, especially at the climacteric. It was noteworthy also that violent palpitation, clammy sweat, diarrhœa, starting eyes, and choking were the symptoms produced by sudden fright. It was, therefore, reasonable to look to some relaxation of the sympathetic as a cause of the combination of symptoms seen in Graves' disease. The disease also seemed to have some relations with anæmia and chlorosis. Belladonna was the only drug in which he felt any confidence; he had observed the symptoms, even in severe progressive cases, so speedily reduced that he could not doubt the value of the drug. After using it for some weeks it was his custom, as the cases were tedious, to substitute iron, iodide of potassium, or digitalis, but he had observed no good effect attributable to these drugs. He gave the following categorical replies to the series of questions circulated by the Society (see "British Medical Journal," March 13th, 1886, p. 519). 1. He had performed one necropsy; no lesion was found in the nerves or elsewhere. 2. No cause could be assigned in any case. 3. He had seen several cases in young women where the symptoms were modified. 4. He thought the disease removable (or curable). 5. He had had cases under treatment for two or three years with great improvement, but relapses occurred. 6. He had never seen a case recover without treatment. 7. In none of his cases had the eye become diseased, or vision imperfect. 8. He had never seen a case of simple exophthalmos. 12. He had never seen Graves' disease in conjunction with others (but he referred to Dr. Carrington's case, mentioned below). 13. He had only seen two males affected with the disease; they were aged 24 and 26 respectively. He thought that the disease was

in some way associated with the reproductive organs ; in women he had seen it generally in middle-aged women with families, or in young girls with anæmia and amenorrhœa.

Dr. Hughlings Jackson attached great importance to von Graefe's sign, but had seen well-marked cases of Graves' disease in which it was absent ; mentioning, in illustration, the cases of two sisters. Again, he had found the sign present in a man who had no Graves' disease. These observations had been confirmed by Mr. Couper. Referring to the cases of the two sisters above mentioned, Dr. Hughlings Jackson remarked that a third sister was said to have the same morbid affection. Dr. Cheadle had seen four cases of Graves' disease in one family. Dr. Hughlings Jackson suggested a comparative study of such cases with some other "family diseases," such as pseudo-hypertrophic paralysis, Friedreich's disease, &c. In all the recent (eight) cases of Graves' disease he had seen, the right lobe of the thyroid was the larger, a fact bearing on the question as to central pathology, as Dr. W. A. Fitzgerald had suggested (*vide* O. R., Vol. II., p. 148). The right vagus had, in some lower animals, more inhibitory influence on the heart than the left. Dr. Hughlings Jackson thought the hypothesis of a central pathology the most probable, and in this connection referred to the experiments of Brown-Séquard and Filehne on the production of exophthalmos by injuries of the restiform body. He believed that most would be learned as to the seat of changes in Graves' disease from experiments on lower animals. In all cases of fatal Graves' disease the medulla oblongata and pons Varolii should be carefully searched microscopically. He referred to so-called complicated cases, mentioning the remarkable case recorded by Dr. Warner and Dr. Bristowe, in which there was ophthalmoplegia externa, and a like case which he had seen, a case complicated with asthmatic paroxysms, one with paroxysms of right-sided facial spasms, unlike cortical facial spasm, and a variety which he supposed to depend on discharge of facial centres in the pons Varolii. Dr. Pavy had noted the association of Graves' disease with diabetes. In the so-called complicated cases the associations might be accidental, but Dr. Hughlings Jackson thought they deserved very careful consideration. He did not remember seeing a case of Graves' disease in a man.

Dr. Fitzgerald had never yet seen the visible pulsation of the arteria centralis retinæ described by de Wecker. Visible pulsation of the veins was very frequent. Von Graefe's sign was not constantly present. In the cases in which a perfect cure occurred some of the ordinary symptoms were absent or little marked. In some cases only one eye was affected by proptosis. He had seen one well-marked case in a man, aged 28, at the Meath Hospital, under the care of Dr. Foot, in whom the affection had come on after excessive dancing.

Mr. Hill Griffith presented the following analysis of thirty-two cases observed in the Manchester Eye Hospital:—

Sex.—Female ...	29		*State.*—Single ...	20
Male	3		Married ...	12
	32			32

Ages at Commencement of Symptoms.

Under 20	3
20—30	16
30—40	8
40—50	5
About 50% were thus between 20 and 30.	32

Symmetry of Eyes.

Bilateral	25	or 78%
Right eye	4	or 22%
Left eye	3	
	32	

Retraction of Upper Lid (Stellwag).

Present ...	19	Of these, 3 showed also retraction of lower lid.
Absent ...	3	Of which 2 showed retraction of lower lid, and the other had well-marked proptosis.
Not noted ...	8	
And in ...	2	there was retraction of lower lid only.
	32	

Loss or Impairment of Consensual Downward Movement of Upper Lid (Graefe).

Present	6
Absent	4
Not noted	22
	32

Goitre.

Bilateral ...	16	Of these, 3 were more marked on right side: in 4, "hammering of carotids;" and in 3 a thrill was noted in the swelling.
Right sided	2	
Absent ...	14	
	32	

Vision.

Normal ($\frac{6}{6}$)...	20	
Subnormal...	12	Of these 12—in 2 the defective sight was certainly not due to errors of refraction or intraocular disease; in the remaining 10 it was due to nebula corneæ, high degrees of myopic astigmatism, &c.

Refraction.

E. or slight H. ...	24
High H. ...	1
M. ...	4
Astig...	3
	32

State of Fundus.

Normal ...	28	
Abnormal ...	4	Of these 4—2 monocular high myopia, both had binocular exophthalmos; 1 corkscrew veins; 1 glistening striated patch at upper and outer part of one disc.

Spontaneous arterial pulsation was looked for in every case and was not found once, but in 4 cases there is no note.

Illness at Date of Commencement of Eye Symptoms.

Acute gastric vomiting and prostration (in some cases also diarrhœa) ...	12
"Liver complaint"...	2
Severe cough with vomiting ...	1
Rheumatic fever ...	1
"Lost flesh" ...	2
Sleeplessness and headache ...	2
Post nasal catarrh ...	2
Menstrual disorders...	2
Symptoms came on 3 months after marriage ...	1
No general symptoms at commencement ...	7
	32

Nervous Condition.

"Felt as if she would choke"	1
Distinct hysterical attack	1
Easily frightened and nervous	2
"Fussy" behaviour, very marked...	1
Often flushed up and changed colour	1

Menstruation.

Menopause 2 years ago	1
Severe periodic headaches	1
Ceased for 6 months from date of gastric symptoms ...	1
Ceased at commencement of symptoms but returned ...	1
Scanty shortly before symptoms	1
Irregular	2

Sequence of Symptoms.

In the 18 cases in which both goître and exophthalmos were present—

The goître preceded the exophthalmos by 2 years, 1 year, and 6 months respectively	in 3 cases
Goître and exophthalmos synchronous	„ 2 „
Exophthalmos first noted by patient	„ 1 „

Dr. Samuel West read a paper on thirty-eight cases of exophthalmic goître. In his experience the proportion amongst out-patients was about one case in every 1,000. Two-thirds of the cases occurred before the age of 30. There were three male cases in a total of 51. The ocular, thyroid, and cardiac symptoms all appeared simultaneously in six cases; the thyroid enlargement occurred first in eight cases; palpitation appeared alone and first in nine cases; exophthalmos came first and alone in four cases. There was thus great irregularity in the relative time of appearance of the cardinal symptoms. The right lobe of the thyroid was larger than the left, when there was any difference between the two. In one case, a marked decrease in size of the thyroid occurred after an acute attack of pneumonia. Exophthalmos appeared generally to be a late symptom. Von Graefe's sign was noted only in seven cases. Von Graefe's statement, that the pupils were never dilated, was not absolutely true. In one case, there was slight ptosis of both eyes; in another, there was persistent crossed diplopia and an external squint of the left eye. Attacks of profuse sweating were noticed in four cases. Seven times, uncontrollable and unaccountable diarrhœa was observed, and six times

paroxysms of vomiting. Diabetes mellitus was present in one case. A bronzing of the skin, suggestive of Addison's disease, was remarked in another, for which no explanation could be found. Changes in temperature were recorded seven times; twice there was remarkable pyrexia, recalling that met with in cerebro-spinal disease. Other nervous symptoms noted in some cases were change in manner and character, somnambulism, trembling, fits, megrim, neuralgia, insanity, and chorea. In eight cases there was a definite history of rheumatic fever. Considering the rarity of exophthalmic goitre, it was remarkable that rheumatic fever should be so often associated with it; possibly the severe organic valvular disease noted sometimes might be due to antecedent rheumatic fever. Overwork, severe parturition, blows, fits, and rheumatic fever were causes assigned in a few cases; in the majority, no cause was given. No constant relation could be established between the disease and the catamenia. In some cases, there was a family history of nervous disease. The longest duration of the disease was nine years; the shortest, two months. In three fatal cases, the disease had lasted respectively four years, two years, and three months. The constant application of cold seemed to have undoubted influence for good in the treatment of some cases.

Dr. Carrington related the case of a woman, aged 23, who gave a family history of phthisis; she had suffered from megrim; palpitation and proptosis had been noticed for three years. Two months before admission she began to suffer from vomiting, great exhaustion, amenorrhœa, and epistaxis. When admitted, she was fairly nourished; the skin was generally dark, the pigment being most marked on the eyelids, chin, neck, abdomen, the flexure of the joints, the axillæ, and the areolæ; numerous small, freckle-like spots had come out since admission. Proptosis and von Graefe's symptom were well marked, but the other orbital muscles were normal. The pupils were almost immovable. The thyroid was moderately enlarged, the right lobe being larger than the left. At the base of the heart was a loud systolic murmur. The pulse was extremely small and feeble, as in Addison's disease. Three fatal cases of exophthalmos had occurred during the last two years, at Guy's Hospital. Two of the patients died of acute enteritis, and one of mitral regurgitation.

Mr. C. Higgens related the case of a woman, aged 29, in whom the exophthalmos was so extreme that it appeared desirable to attempt to partially unite the margins of the lids; the patient died under the influence of an anæsthetic. (*Vide* "Transactions of the Pathological Society," Vol. XXV., p. 240.) The main points noted at the necropsy (by Dr. Goodhart) were enlargement of the thyroid gland and thyroid veins, and slight hypertrophy of the heart; thickening of the sympathetic capsule, and of the mediastinal and cervical connective tissue; growth of gland-tissue in the region of the thymus, and tendency of the lymphatic glands, elsewhere, to enlarge.

Mr. Mason, of Bath, described the case of a woman, aged 35, in whom the eye was dislocated, slipping in front of the lids on the slightest touch.

The President said that a tendency to dislocation had been noted in other cases.

Mr. A. Q. Silcock described the *post mortem* appearances in a woman, aged 30, who died of uræmia while suffering from exophthalmic goître. The orbits were most carefully examined; there was nothing abnormal about them, except that the muscles were infiltrated with fat (not degenerated). The nerves were quite normal; the sympathetic, in the neck, was normal; the thyroid gland was enlarged, the right lobe larger than the left. This was due to overgrowth of the epithelium of the acini, and of the connective tissue of the gland. He referred to a case in which Dr. Cheadle had described remarkably increased vascularity of the medulla oblongata and pons Varolii. He also related the case of a man, under the care of Dr. Alex. Morison, of Highbury, in whom, though the enlargement of the thyroid was cured by electrolysis, the proptosis still persisted.

Mr. Lang read an epitome of six cases observed by Dr. J. J. Pringle and himself, in which unilateral "lid-phenomenon," without proptosis, was associated with no other evidence of Graves' disease, except slight thyroid enlargement in two of the cases. In four, paresis of orbital muscles was present, and, in three, sensory phenomena (pain, scalding lachrymation, &c.). In none was there cardiac disease or disorder, nor had the patients ever noticed implication of the lower lid. Their observations appeared to support the theory of the central

origin of Graves' disease. They regarded a tonic contraction of the levator palpebræ superioris as the immediate cause of the lid-phenomenon, in opposition to the well-known views of von Graefe.

Mr. W. H. Jessop said that when the eye was brought under the influence of cocaine, the palpebral aperture was widened, and distinct proptosis produced. By dropping cocaine into the eye, in a case of Graves' disease, he had intensified the exophthalmos, and made von Graefe's symptom more marked.

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ON MEANS FOR THE PREVENTION OF MYOPIA.

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To those who are interested in the hygiene of the eye there is hardly at present a more important subject for consideration than the means by which the increasing prevalence of myopia in the community may be checked. With the example of the German nation before us, and in presence of an increasing educational pressure in our own country, we have strong reason for paying attention to it; fortunately our present scientific knowledge of the causes of myopia, although not complete, is sufficient to indicate clearly the nature of the preventive measures required; unfortunately it is a matter of great difficulty to bring these measures into general operation.

The causes which contribute to the production of myopia are complex, and of several kinds:—

Firstly.—There is the hereditary predisposition. Different observers estimate the importance of this factor very differently, but hardly anyone will deny that under similar circumstances the children of myopic parents are more liable than others to acquire myopia, and that this fact is a weighty one in relation to the

general progress of the disorder through successive generations. Whether the transmitted tendency depends chiefly on peculiarities in the tissues of the eyes themselves, or on the mechanical relations subsisting between the eyes on the one hand, and the muscles, the optic nerves, and the orbits on the other, is not yet positively known.

Secondly.—There is the supposed correlation between the growth of the brain and the growth of the eye, by reason of which a high degree of cerebral development is apt to be associated with an over-development of the eye (see O. R., Vol. II., p. 206).

Thirdly.—There are certain exceptional causes, probably connected with abnormal conditions of circulation, nutrition, and tension in the globe, which sometimes produce high degrees of myopia in very young persons, and in those who have never used their eyes much on near objects, or which cause a rapid development of the same during acute febrile diseases.

Fourthly.—There is the excessive use of the eyes on near objects, involving excessive convergence, with consequent traction on the tunics, accommodative strain, and congestion, due to the bent position of the head. To these three factors different investigators attach different degrees of importance, but all are agreed that such close application, especially in early life, and when combined with strong mental effort, is the main cause of the present prevalence of myopia amongst civilised races.

In spite, therefore, of the complexity of the subject, and of some uncertainty as to the pathological processes by which the eye becomes elongated, the indications for preventive measures are clear, and there is a general agreement that our efforts to this end must be directed mainly against over-use of the eyes in near work, especially during the period of childhood and youth.

To prevent myopia we must prevent young people from using their eyes too closely and too long on near objects.

This principle was established long since by the labours of Donders, Arlt, and others, and has been practically developed by Cohn and other reformers of School Hygiene.

The object of my present communication is not by any means to deal with the whole of this large subject, the literature of which is already voluminous, but merely to describe one or two contrivances by which I have endeavoured to meet some of the difficulties of the case, and which may be of use or interest to readers of this Review. In the recent essay by Professor Fuchs on "The Prevention of Blindness" (see O. R., Vol. IV., p. 93) may be found an excellent and comprehensive epitome of the various means at present advocated for the prevention of myopia.

A Portable Slope for Reading and Writing.

A principal requirement is that the young scholar shall sit while at work in a comfortable position, without undue bending or twisting of the spine, and with his work so placed that he can see it easily at a proper distance. In the best ordered schools considerable attention is now given in the class-rooms to this requirement, but in dealing with young myopic patients, the oculist is often met by the difficulty that a boy or girl who during the daytime has, perhaps, every advantage in the way of hygienic school-furniture, habitually works at night, whether at home or in the school-study, in the most unfavourable positions. Yet it is just during the hours of evening study that proper arrangements are

most necessary; at night the scholar has to work by artificial light; being tired he is especially apt to stoop and loll, and he is commonly under no skilled supervision. To meet this difficulty I devised some years ago a simple and inexpensive slope for reading and writing to be used at home or elsewhere on any ordinary table. It is made by the Midland Educational Company, of Corporation Street, Birmingham, and sold for about five shillings. As used in writing it presents an even surface 17 inches (43 cm.) square, which has a slope of 15 degrees or a little less; for reading, the further part is raised to an angle of 45 degrees, the act of raising creating a groove in which a book will rest securely; the position of the reading slope aids materially in maintaining a proper distance between the eyes and the book. In copying from a book or in using two books simultaneously, as in translating with the dictionary, the two slopes may be conveniently used together.

The construction of the slope is indicated in Nos. 2 and 4 of the following series of figures, which were originally prepared for the purposes of a "Health Lecture," dealing with the common causes of failure and loss of eyesight and the avoidance of the same, delivered in Birmingham in 1884.* In this lecture I dwelt at some length on the prevention of short sight, and exhibited by means of the magic lantern the series of pictures showing a schoolboy at work in bad positions and in good positions, which I here reprint, together with their descriptions. I have often found them useful when endeavouring to impress upon youthful myopes the need of self-correction in these matters. They were drawn with the help of photographs taken from life.

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* Birmingham Health Lectures. Second Series, 1884. Birmingham: Hudson & Son, Edmund Street. London: Hamilton, Adams, & Co., Paternoster Row.

Fig. 1.

A bad but common position in writing—not the boy's fault. The seat is too low and too far from the table. The table is flat instead of sloping. The boy *cannot* sit upright or keep his eyes at a proper distance from his work.

Fig. 2.

A good position in writing. The back straight, the shoulders square, the work exactly in front, the eyes at least twelve inches from it.

Fig. 3.

A bad position in reading. The head much bent, the eyes much too near the book, for the same reasons as in Fig. 1.

Fig. 4.

A good position in reading. The book placed in a way which allows the boy to keep his head upright, and to sit comfortably in his chair.

Fig. 5.

A bad light; a small print; a difficult lesson. The boy hopes to get the Latin Grammar into his head by putting his head into the Latin Grammar. He is doing his best, without knowing it, to make himself short-sighted for life, and is very likely to succeed.

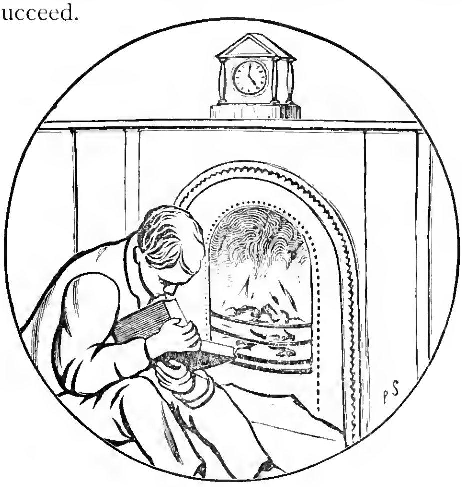

Fig. 6.

Five o'clock in the afternoon—"too soon to light the lamp." The gocd boy will not waste his time; he does his lessons by firelight. Perhaps, however, it is not a lesson book which he is reading but "Robinson Crusoe" or the "Boys' Own Book." If so it is all the worse, for he is less likely to put it down.

A New School Desk.

Much ingenuity has been devoted to the construction of school desks and seats, and very many different models, each claiming some advantages, have been publicly exhibited during the last few years. (For the foreign models see Prof. H. Cohn's *Hygiene des Auges*, of which an English translation is to appear shortly, and his reports on the International Exhibitions of Vienna and Paris.) It appears, however, that from one cause or another, *e.g.*, complex construction, high price, or incorrect principle, most of these leave something to be desired, and that the ideal desk which shall satisfy alike the scholar, the teacher, the paymaster, and the medical inspector, has still to be made. I doubt whether such an ideal desk is actually a possibility, but I venture to think that there is still room for further improvements. At the request of the Midland Educational Company, I have lately designed a school desk which embodies the recognised essentials in as simple and inexpensive a manner as seems to me to be possible. These recognised essentials are as follow :—

1.—The seat must be of such height as will allow the scholar's feet to rest flat upon the floor or footboard, and broad enough to support the greater part of the thigh.

2.—The seat must have a back placed at such height as to fit the hollow of the back below the shoulder blades, and support the body in a vertical position.

3.—The near edge of the desk must be just so high above the seat that when the scholar sits square and upright with elbows to the sides, the hand and forearm may rest upon the desk without pushing up the shoulder.

4.—As used in writing, the desk must have a slope of 10° to 15° (about 1 in 5) ; as used in reading, it must support the book at an angle of about 45°, and at a distance of at least 12in. from the eyes—16in. is better (30—40c.m.)

5.—As used in writing, the edge of the desk must overhang the edge of the seat by an inch or two, in order that the scholar shall not need to stoop forwards, and that the support to the back may be maintained.

6.—Either the desk or the seat, or some part thereof, must be movable at pleasure, so that although the desk usually overhangs the seat the scholar may be able at any time to stand upright in his place.

7.—The desks and seats must be of various sizes, in order that the foregoing conditions may hold good for scholars of various ages.

In a recent paper describing a systematically graduated series of desks (" Progressieve Schoolbanken," J. van Druten, Utrecht), Professor Snellen gives the following valuable table of proportionate dimensions, which I here reprint for future reference. It will be seen that the dimensions increase in all cases by one-tenth from each grade to the next. The measurements are given on the metrical system ; I have here added the corresponding inches. I have omitted Snellen's measurements from footboard to floor, as they apply to his desk only.

Adopting with little alteration the proportions given by Snellen for the various parts of his desk, I have, for the sake of convenience and economy, slightly altered the progression, and reduced the number of sizes to four. Instead of advancing by increments of one-tenth, which is doubtless the right method from the theoretical point of view, I divide the scholars according to their heights into four classes advancing in each case by six inches : thus 3ft. 6in. to 4ft., 4ft. to 4ft. 6in., 4ft. 6in. to 5ft., and 5ft. to 5ft. 6in. The dimensions of the desks are suited to these four heights. The series, of course, can be extended in either direction, though it will hardly be necessary to provide a standard size for scholars of 6ft. 1in. to 6ft. 10in., as in Snellen's No. 8. The second table gives the dimensions of my desk—the " hygienic desk,"—Nos. 1, 2, 3, and 4.

Prof. Snellen's Table.

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	Per cent.
Height of scholars	Metre. 0·95–1·05 Inches. 37½–41½	Metre. 1·05–1·16 Inches. 41½–45½	Metre. 1·16–1·27 Inches. 45½–50	Metre. 1·27–1·40 Inches. 50–55	Metre. 1·40–1·54 Inches. 55–60½	Metre. 1·54–1·70 Inches. 60½–66½	Metre. 1·70–1·86 Inches. 66½–73	Metre. 1·86–2·04 Inches. 73–80 (?)	
Height of seat	0·286 11¼	0·314 12¼	0·346 13½	0·380 15	0·418 16½	0·460 18	0·506 20	0·557 22	100
Breadth of seat (front to back)	0·214 8½	0·236 9¼	0·260 10¼	0·285 11¼	0·314 12¼	0·345 13½	0·380 15	0·418 16½	75
Edge of desk to seat (vertical) Upper edge of back to seat ..	0·172 6¾	0·188 7½	0·208 8¼	0·228 9	0·251 9¾	0·276 10¾	0·304 12	0·334 13¼	60
Positive distance from desk to seat (horizontal)	0·072 2¾	0·078 3	0·086 3⅜	0·095 3¾	0·104 4⅛	0·115 4½	0·126 5	0·139 5½	25
Negative distance from desk to seat (overhang) ..	0·021 ¾	0·024 ⅞	0·026 1	0·028 1⅛	0·031 1¼	0·035 1⅜	0·038 1½	0·042 1⅝	7·5
Breadth of desk front to back	0·350 13¾	0·350 13¾	0·350 13¾	0·350 13¾	0·450 17¾	0·450 17¾	0·450 17¾	0·450 17¾	

"Hygienic Desk."

Height of scholars ..	No. 1. 3ft. 6in.--4ft. 107-122cm.	No. 2. 4ft.--4ft. 6in. 122-137cm.	No. 3. 4ft. 6in.--5ft. 137-152cm.	No. 4. 5ft.--5ft. 6in. 152-168cm.
a. Height of seat from floor..	13ins. 33cm.	14½ 37	16 41	18 46
b. Breadth of seat	10 25·5	11 28	12 30·5	13 33
c. Height from seat to edge of desk .. .. .. Height from seat to top of back	8 20	8¾ 22	9½ 24	10½ 26·5
d. "Overhang" of desk ..	1 2·5	1 2·5	1½ 4	1½ 4
e. Play of desk	4½ 11·5	4½ 11·5	6 15	6 15
f. Breadth of desk (front to back)	15 38	15 38	17 43	17 43

Slope of desk 1 in 5.

Its general construction is shown in the following figures. The standards and the cross-pieces which unite them are of cast iron. The back, the seat, the top of the desk, and the shelf beneath it, are of wood. The only points which require description are the book-rest, and the arrangement by which the desk is made moveable at pleasure.

The book-rest resembles that previously employed in my portable slope (see Fig. 4), except that the flap which supports the book does not extend the whole width of the desk, but occupies the middle portion only, leaving room for an ink pot to be let into the wood at the side of it. The flap when in use is supported by a small stop which hangs from its further edge, and which, though quite firm, can be pressed back by a touch of

the finger when the book-rest is no longer wanted. The flap is pivotted in such a way that its near edge sinks below the surface of the desk when the flap is raised, and thus creates a groove for the book to rest in (see Fig. 8).

FIG. 7.

The wooden top of the desk is screwed to two sloping cast iron brackets which pass from back to front, one at each side of the desk. Each of these brackets carries beneath its lower or horizontal border a round iron rod, the two ends of which are fixed to the bracket. The rods slide freely through holes or eyes on the upper surface of the standards. By this means the desk is

able to slide upon the standards in a direction towards and from the scholar. When the desk is pulled forward a notch in the near end of each rod engages with the eye in which the rod slides so that the desk is secured in this position, and is not liable to slide away from the scholar if he leans against it. By lifting the front edge of the desk the notches are disengaged and the desk is easily pushed back, so that the scholar can stand up in

FIG. 8.

his place. This is a mechanism which does not get out of order, and which cannot injure those who use it, or be injured by them. The whole desk can, I believe, be made at a cost not much greater than that of many of the old-fashioned un-hygienic patterns now in use.

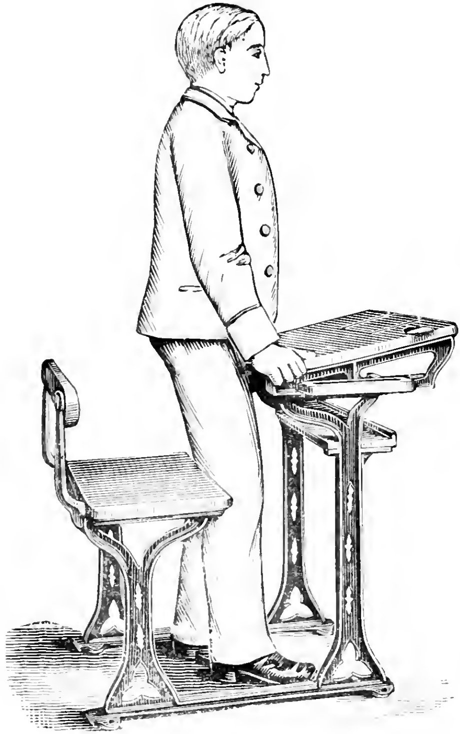

Fig. 9.

School Test-Types.

A more careful regulation of the postures in which school children work, and a systematic avoidance of overwork, are no doubt the chief measures upon which we must rely for the prevention of myopia, but they are not in themselves sufficient. We want a system of supervision by which every case of defective sight shall be detected at the beginning of school-life, or at any time when the mischief may arise, so that the measures necessary to prevent progressive mischief may be adopted at the outset.

This has been advocated by many writers. The recommendations given by Fuchs on the point are to the following effect:—"The Government should appoint and remunerate medical inspectors for schools. In places where an ophthalmic specialist is to be found the examination of the eyes of the scholars should be entrusted to him. In all intermediate and high schools the refraction of every scholar should be tested and recorded at the beginning of each school year. It should be the duty of the inspector also to indicate the special placing in the class-room of such of the scholars as may require it on account of defects of sight; also, to prescribe glasses for such as need them, and no scholar should be permitted to wear glasses which have not been prescribed after proper medical examination He should also indicate the cases in which certain subjects of study ought to be abandoned on account of defective sight, and communicate the necessary precautions to the parents of the scholar." (Vide O. R., Vol. IV., p. 99.)

If there were any hope of placing all our English schools under systematic medical inspection it might well be made a part of the inspectors' official duty to test the eyesight of the scholars at stated intervals, and if the inspectors had a practical knowledge of errors of refraction and their treatment, the whole matter might be left in their hands. As a matter of fact, however, these conditions do not exist, and the prospect of introducing them is very remote. If the desired supervision is to be obtained at all, it must, for the present at least, be sought in some other way. On the other hand, to ask that a specialist shall be periodically called in to test the eyes of the scholars in every school is a large demand, and goes, I think, beyond the requirements of the case. The object could be gained more easily.

The principal of every school, either himself or through one of his assistants, should make it a part

of his duty to test the eye-sight of all his pupils once in each year. A set of test-types hung upon the wall of the school-room in a good light, and a line drawn upon the floor, are the only apparatus he would require, and he would need no technical knowledge. He would need only to know that any scholar who is unable to read given letters at a given distance has a defect of sight of some kind or other. He should report the fact to the parents, and there his duty in regard to it should cease. With the parents should lie the responsibility of obtaining competent advice as to the nature of the defect, the necessity for wearing glasses or for restricting work, and so forth.

Many principals of schools now interest themselves much more than formerly in the question of school-myopia, and it would probably not be difficult to get this plan adopted speedily in many of the higher-class schools, in which the necessity is greatest. It should be necessary only to make the need for such an examination known, and to place in the hands of teachers the means of making it with a minimum of trouble. In the Health Lecture already referred to, I drew public attention to the matter in this neighbourhood, and at the same time caused to be printed and published by the Midland Educational Company a set of "school test-types." The letters correspond to Snellen's 12-feet, 20-feet, and 40-feet types; and are placed in three groups, numbered 1, 2, 3. The sheet of letters is pasted inside a folding cover, so that when not actually in use it is not soiled by exposure. On the opposite leaf of the cover is printed the following explanation, with directions for use, &c.:—

The object of these types is to supply a ready means of testing the eye-sight of school-children. It is desirable that, in every school, such a test should be applied to the whole of the children at least once in each year.

Prolonged use of the eyes on near objects, as in reading, writing, sewing, drawing, &c., tends, in the case of certain children, to an alteration in the shape of the eyeball, and the production of permanent *short-sight;* and this, when it has once begun, is apt to increase from year to year through-

out the whole period of school life. Short-sight, acquired in this way, does not at first interfere with study, and therefore often advances unnoticed, and attains a considerable degree before steps are taken to check its progress. To minimise the evil, it is essential that such defects of sight should be recognised at the outset, and that precautions to prevent their increase should be adopted early in the school career. The simplest means of attaining this end is a periodical testing of the eyesight of all school children in the way described below.

In addition to cases of short-sight, this test will of course bring to light defects of vision of other kinds. The latter, though not *caused* by school work, and not necessarily increased by it, are in many cases a hindrance to the scholar's progress; and if capable of correction should be corrected early. Their detection is therefore only second in importance to the detection of incipient short-sight.

DIRECTIONS FOR USE.

Hang the card upon the wall *in a good light*, and place a mark on the floor at a distance of *exactly twelve feet* from the wall. Let the scholar stand with his toes to the mark, and let him read the letters in division No. 1. Each eye should be tried separately, the other eye being covered with the hollow of the hand, without being pressed upon.

If No. 1 cannot be read, the sight of the eye is below the normal standard.

If No. 2, and still more if No. 3, cannot be read, there is a considerable defect.

When several scholars are tested together, one should be made to read the letters in horizontal lines, the next in vertical lines or in the reverse order, and so on, so that they may not learn them by ear one from another.

PREVENTION OF SHORT SIGHT.

The prevention of short sight consists in preventing young people from using their eyes *too long and too closely on near objects.* The amount of near work must not exceed reasonable limits. The manner of doing it must be such as to minimise the strain upon the eye—the scholar must be taught to work with his head as upright as possible, and with his eyes at least twelve inches from his work. The following are the principal means to this end :—

He must have a comfortable seat, with a support for the lower part of his back. He must work at a sloping desk, not at a flat table. He must be so placed that there is a good light upon his work, and that he is not dazzled by light from in front. His books must be printed in good large type, easily legible at the required distance. He must be accustomed to read with the book placed or held well up in front of him, so that he may not stoop over it. He must be taught to write sitting square to the desk, and upright; not twisted to one side, and bending over it. These things must be attended to at home as well as at school.

The adoption in our schools of the custom here advocated would, I am confident, be productive, in the

course of a few years, of a great deal of good. It would save from needless aggravation many of those cases of defective sight which now pass unheeded, until the increasing failure becomes an actual hindrance to further study. It would call the attention of teachers, of parents, and of scholars to the frequency of damaged eyesight in our schools; and would thus arouse that general interest on the part of the public which must precede an efficient reform.

JANNIK BJERRUM (Kopenhagen). **Light-sense and Form-sense in various Eye Affections.** *V. Graefe's Archiv. XXX., 2., p. 201.*

The light-sense, or the power of the retina to distinguish illuminations of different intensities, is measured partly by ascertaining the irritation curve (Reizschwelle—the smallest quantity of light perceivable), and partly by ascertaining the difference curve (Unterschiedsschwelle—the smallest perceivable difference between two objective illuminants). The first is itself only a difference, being the expression of the difference between sensation without objective light (the natural light of the retina) and sensation during the smallest perceivable objective light. It is known by experiment that the smallest perceivable light depends both upon the size of the retinal image thereof, and on the absolute amount of the light itself. Bjerrum criticises the methods hitherto employed to determine the light-sense, and concludes that it is *à priori* incorrect to be content with the use of one instrument alone, like Förster's photometer or Masson's disc. His own observations bear out this conclusion, as he has found the light-sense affected while using the one test, when it has been normal or nearly so if submitted to the other, so that both species of test are necessary.

The method employed by the author consists in Masson's discs on the one hand, and a series of test-type formed like those of Snellen on the other hand. In addition to Snellen's black letters on white ground, Bjerrum uses four other tables of grey letters, the brightness of the letters compared with the

white ground being on the tables 0·6, 0·7, 0·8, and 0·9 respectively; the ground's brightness being = 1, and that of Snellen's black letters being assumed = 0. The patient is tested by each of these various tables, both in daylight and in various grades of diminished illumination; the degree of illumination employed being ascertained either by a photometer or by the amount of vision possessed by Bjerrum with the given illumination.

Bjerrum considers that the light-sense is indubitably defective when vision diminishes disproportionately with diminished illumination; but the point to be determined as to what is a disproportionate decrease is not so clear. Mauthner says that when an amblyope's vision decreases more than that of a normal eye with diminished illumination, the light-sense is defective; but Bjerrum holds this statement to be *à priori* unsound, and to be disproved by the observations he has made.

It seems plain that when two individuals have equal vision in daylight, and the vision of one decreases more rapidly than that of the other as the illumination lessens, then that individual has a defective light-sense. Starting from this principle, Bjerrum has tested series of amblyopes possessing the same amount of vision in daylight, and finds that the vision of some decreases much more rapidly than that of others as the illumination lessens, and draws the conclusion that, in these at all events, there must be a diminished light-sense. (*Vide* Treitel *per contra*, O. R., p. 172.)

His general conclusions agree in the main with Förster's, that defective light-sense is present as a rule in choroido-retinal diseases, such as retinitis pigmentosa, choroido-retinitis syphilitica, and choroiditis disseminata. It is of course possible that the amblyopes whose vision remains relatively good in diminished light may also have defective light-sense, but this would not interfere with the general conclusion that defective light-sense is a special characteristic of the diseases enumerated above; and this position is still further strengthened by Bjerrum's observation that he always finds the light-sense most acute in the amblyopes in each class whose amblyopia is merely due to optical causes, such as ametropia or incorrect glasses. In fact, the weaker the illumination the

more closely does the vision of these latter artificial ametropes approximate to that of a normal individual. He finds, too, that many amblyopes behave exactly like these optical amblyopes in diminished light, so far as their form-sense is concerned.

Patients with atrophy of the optic nerves possess diminished sensibility for differences in illumination in good light, while those with amblyopia congenita and amblyopia in strabismo exhibit no definite defect in either direction. Patients with toxic amblyopia behave towards the tests like those with atrophy of the nerves.

Bjerrum gives a number of cases exhibiting the mode in which he applies his tests, and the results obtained in the various diseases submitted to examination: and appends a case in which the method of estimating the total light-sense of the retina is illustrated.

TH. TREITEL (Konigsberg). **Night-blindness and the Light-sense.** *Graefe's Archiv., XXXI., 1., p.* 139.

The author, in common with many Continental writers, uses the term Hemeralopia to indicate night-blindness, instead of the correct term, Nyctalopia. In order, therefore, to avoid misunderstandings, the word "night-blindness," about whose significance there can be no misconception, will be employed in the following brief abstract of Treitel's paper as a substitute for the German "Hemeralopie" or "Nachtblindheit."

In all investigations upon the light-sense it is important to exclude so far as possible the influence of the form-sense, a point which the author considers has not been sufficiently attended to by Förster in his observations. The instrument Treitel employs is a slight modification of Förster's photometer. This he uses to ascertain the smallest quantity of light that enables the patient to perceive the glimmer of a square of white paper whose sides measure 3 mm. Förster's formula expresses, then, the light-sense $L = \frac{h}{H}$; h in this case $= 3$. Evidently the central light-sense can only be tested thus when central vision exceeds a certain grade. The light-sense of the whole visual field is tested similarly by a square of paper whose sides measure 3½".

The results obtained by this method, in the normal eye, differ from those found by Förster, and the difference is greater for the central than for the total light-sense.

Besides the light-sense, Treitel tested in each case the central acuity of vision, the limits of the field of vision, and the peripheral and central colour vision, the last by means of Bull's chromatoptometric tables.

The point which Treitel contends is established by his observations is that night-blindness (idiopathic) is nothing more or less than a defective power of adaptation. All men are night-blind on first entering a darkened room; but a short time suffices for physiological adaptation in healthy eyes, while it takes days to effect that process in certain morbid states. For instance, Treitel found that a night-blind boy of fourteen (a typical case, with xerosis conjunctiva) took thirty-three hours to effect the adaptation that a normal eye effects in from fifteen to twenty minutes. That is to say, that the boy's eye lost its night-blindness gradually under a dark bandage, until, at the end of thirty-three hours, the defect had quite disappeared. The character of the amblyopia exhibited by healthy eyes on first entering a darkened room is exactly similar to that found in night-blindness, even large objects, which after adaptation are perfectly visible, being quite unrecognisable at first; and the defects of colour-vision are also similar in the two cases. Treitel's observations upon this latter point (defective colour-vision in non-adapted eyes) corroborate the results obtained in Landolt's experiments upon colour-vision in diminished light. (*Graefe, Saemish. Handbuch*, II., *p.* 535.) Treitel found that the non-adapted normal eye, in a darkened room, at first can distinguish no colours: yellow, green, and white seem light merely; red and blue are quite invisible. After fifteen to twenty minutes' adaptation, yellow and green become visible as such, blue seems grey, and red appears black.

The abnormalities of the light-sense in night-blindness are fully accounted for by the hypothesis of retarded adaptation. The non-adapted healthy eye possesses a very defective sense for differences of illumination; and the apparent diminution in the light-sense in night-blindness attains precisely that degree which can be accounted for by defective adaptation. According to Aubert, adaptation in a darkened room multiplies the

light-sense, in from fifteen to twenty minutes, by as much as 35 : and Treitel finds that the light sense of a non-adapted eye is a little more than $\frac{1}{40}$ of that of its fully adapted fellow; so that the values found by Förster for the light-sense in night-blindness are quite compatible with the theory of defective adaptation. When in severe cases the fraction is found still smaller than $\frac{1}{35}$ to $\frac{1}{45}$, it is probable that sensibility for differences in illumination is diminished by daylight as well; and in this connection it should be noted that Treitel finds the light-sense of the fully adapted eye, in a darkened room, equal to what the same eye possesses in a good illumination. Finally, it is found that night-blindness and adaptation both run their course in the one eye of an individual, without any reference to the condition of affairs in the other eye. Treitel employs this theory of imperfect adaptation to explain the symptomatic as well as the idiopathic form of night-blindness.

The fact that in idiopathic night-blindness functional defects, as a rule, only appear in defective illumination, leads Treitel to draw an important distinction between the visual defects in night-blindness and those in the known diseases of the nerve and retina. If a night-blind eye possesses normal sensibility for light, colour, and form in good light, it is impossible to account for the night-blindness by assuming an abnormality in any one of these three senses; and the anomalies they exhibit in lessened illumination must depend upon some pathological process that is perfectly different to what occurs in the known diseases of the nervous apparatus.

The evidence upon which it is assumed that the light-sense is affected in night-blindness consists entirely of observations upon the influence that different degrees of absolute illumination exercise upon the power of perceiving objects with a constant difference in brightness, and Treitel contends that such observations are useless for testing any function except that of adaptation. Förster's photometer then is useful only in testing the light-sense in normal eyes and in those amblyopes who are not night-blind. His table serves to test for the presence of night-blindness, and Treitel's modification in the photometer can be used to examine the light-sense in night-blindness.

Treitel's criticism of the methods hitherto employed for testing the light-sense is briefly as follows. The methods which

proceed by testing the smallest perceivable difference of illumination in daylight are sound in principle. These are Masson's disc, and its modifications by Donders, Pflüger, and Bjerrum; Bull's photometric charts, and Snellen's types as modified by Bjerrum. On the other hand, the methods of Weber and V. Hippel, Bjerrum's plan of testing visual acuity by Snellen's types under different amounts of absolute illumination, and the smoked-glass photometer of Schnabel and Schmidt Rimpler are not light-sense tests at all, but merely serve to ascertain the presence or absence of night-blindness.

Treitel further criticises the results obtained by Förster and Bjerrum. The figures obtained by Förster for the light-sense in his first group of diseases (optic nerve affections, etc.) may be regarded as approximately correct, but the figures in the second group (retino-choroidal affections) should be multiplied by twenty in order to obtain anything like a fair value for the light-sense in these patients; and if this be done it will be seen that there is really no essential difference in the light-sense in the two groups—from retarded adaptation the light-sense will appear $\frac{1}{20}$ of what it actually is in night-blindness—in exaggerated cases $\frac{1}{35}$. Bjerrum is the only man who has made a direct examination of the light-sense of amblyopes in daylight, and his results seem to show a lessening of the sense to $\frac{1}{5}$ or $\frac{1}{9}$. His statement, however, that the irritation curve and the difference curve can vary independently of each other cannot be accepted if night-blindness is not an affection of the light-sense.

It must be recollected, too, that there is no such sharply-marked difference in the pathology of the diseases in the two groups as defined by Förster. The light-perceiving apparatus is known to be affected in many of the diseases included in the first group (*e.g.*, apoplexia retinæ, and ret. albuminurica). The more remarkable difference in the two groups depends upon the behaviour of the epithelial pigment, which is so rarely affected in the diseases of the first group and so frequently in those of the second. This observation is taken in connection with Parinaud and Kuschbert's explanation of night-blindness ("Defective secretion of visual purple"), of which Treitel seems inclined to be a modified adherent, in spite of such arguments to the contrary as the fact of the macula (which can be night-blind) possessing no visual purple whatsoever. For

this reason he places the pathological change not in the visual purple itself, but in the epithelial pigment, which is known to secrete the purple.

Louis Wolffberg (Erlangen). Tests for the Light-Sense. *V. Græfe's Archives, XXXI., 1., p. 1.*

The light-sense depends upon four factors: (1), The intensity of the absolute illumination; (2), the difference between the brightness of the object regarded and the background; (3), the size of the visual angle: and (4), the adaptation of the retina. The methods employed to test it may be divided into two classes—(*a*), those which vary the difference between object and background, the absolute illumination and the visual angle being constant, and (*b*), those which vary the absolute illumination, the difference and visual angle being constant.

Wolffberg considers none of the methods perfect, more especially as tests for the peripheral light-sense. He employs coloured cloths of definite size at a fixed distance. The constancy of daylight can be assumed when red of $^1/_2$ m.m., yellow of $1^1/_2$ m.m., and green and blue of 3 m.m. diameter can be recognised at 5 m. distance. The absolute illumination is varied by 15 pieces of tissue paper placed over the window which illuminates the distant colours and the perimeter. If the intensity of daylight be assumed as = 1, and that allowed by the addition of 15 papers = 0, then each paper diminishes the illumination by $\frac{1}{15}$. It is then ascertained how large the test object must be to be recognised, when 1, 2, 3 up to 15 pieces of tissue paper are placed before the window. Test objects of these various sizes are then prepared, which enable an observer to ascertain the value of the illumination on any given day, and which also serve (when this is known) to test visual acuity in children and others, the qualitative colour-sense examination being, of course, a preliminary. A number of examples of the tests applied in different conditions of refraction and disease of media and retina concludes the paper.

S. J. HUTCHINSON (London). Lagophthalmos due to Dental Irritation. *Brit. Med. Journ., Dec.* 5, 1885, *p.* 1077.

At a November meeting of the Odontological Society of Great Britain, Mr. S. J. Hutchinson related the following case of reflex nervous disturbance caused by dental irritation. The patient, a lady, was sent to him by Dr. Gowers, with a request that he would examine her teeth, and see if he could discover any probable cause for a spasm of the left eyelid, from which she had suffered for several months. The eyelid was drawn up by a constant spasmodic contraction of the levator palpebræ. Mr. Hutchinson found the left second and third molar teeth, both upper and lower, much decayed, and extracted all four; but, though the patient no longer suffered from neuralgia as before, the spasm of the eyelid was not in the least diminished. There did not appear to be anything amiss with the other teeth on that side, except that the upper first molar contained a large amalgam stopping; but as the tooth had never given any pain, the patient would not consent to its being interfered with, and returned to her home in the country. When she again presented herself the eye was in the same condition, and after some persuasion the patient allowed Mr. Hutchinson to remove the amalgam stopping in the left upper first molar. He then found a minute exposure of the pulp, on which the filling had evidently pressed, and advised the removal of the tooth. The result was most satisfactory. The patient's appearance at once began to improve; and at the end of six months the difference between the two eyes was so slight that it would not be noticed by a casual observer. It was evident, therefore, that in this case, reflex irritation of the third nerve had been caused by irritation of a branch of the fifth, and this in the absence of any pain in the tooth.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, JUNE 8TH. 1886.

JONATHAN HUTCHINSON, F.R.S., President, in the Chair.

Reported by DAWSON WILLIAMS, M.D.

Foreign Body retained in Eye.—Mr. Brudenell Carter showed a young man, in the background of whose eye a fragment of steel had been embedded for nearly twelve months; the chip had entered one line from the cornea on the outer and lower side, and had gone directly backward, and could be seen embedded in the choroid or sclera, and surrounded by a few small blood-clots. The eye was kept under the influence of atropine; the chip became coated with lymph: the blood-clots underwent absorption, and vision returned to the normal. All congestion had disappeared in three weeks, when the patient returned to his work as a carpenter. Central vision was unimpaired, and the blind spot, due to the fragment, could be found with difficulty. There was never any pain, irritation, or inconvenience at any period of the case; and it seemed probable that the steel was now secured against any future change of position.

The President mentioned that he had met with cases where a foreign body had remained long without causing any disturbance.

Mr. Simeon Snell referred to the three cases he had described last October. He had also met with a case in which a piece of steel was detected lying above the optic disc; but no sign could be found of its mode of entry.

Mr. Brudenell Carter described a case of a dark amber-coloured cataract in one eye, where, after extraction, a small fragment of iron was detected in the centre of the cataract. The man could give no history; he had once witnessed the explosion of a steam boiler, but he was not aware that any accident had happened to his eye at that or any other time.

Cholesterine in Detached Retina.—Mr. Simeon Snell.—The patient, a boy aged 11, had been blind with the right eye since about three years of age. When seen in the early part of 1886, the retina was detached, opaque, and thickened, but more so

in some parts than in others. Cholesterine-plates were studded over the retina, chiefly on the inner side; these were visible to the naked eye, but much better with focal illumination or the mirror. The retina was nearly universally detached, and only at the periphery outwards was a slight glimpse of indistinct red reflex obtained. The character of the subretinal fluid could not be made out. The left eye had a high degree of hypermetropia (8 D), but was otherwise normal. Mr. Snell dwelt especially on the presence of cholesterine, which had been observed in most parts of the interior of the globe.

Mr. Nettleship thought that there was another point of considerable interest in the case; total detachment of the retina at so early an age was most unusual. There was a class of cases where, in children, gross detachments of the retina occured in connection with patches, sometimes white, sometimes yellow, on or behind it, with an appearance as if indicating subretinal hæmorrhage; Mr. Snell's case appeared to belong to this class. In one such case which he had examined, there was a sediment in the subretinal space, consisting chiefly of fat-globules. As to the causation of these detachments nothing was known, but he suggested that there might be some connection between the detachment and an exanthem. The patient whose case he had quoted had recently suffered from scarlet fever.

Dr. W. A. Brailey had published a certain number of cases of detachment of the retina in children in a paper on pseudoglioma. Where a large hæmorrhage occurred, tension was increased, and the vitreous chamber was small.

Unilateral Exophthalmic Goître.—Mr. W. O. Maher (Melbourne). Paper read by the Honorary Secretary. The patient was a man, aged 34. Exophthalmos had been noticed by the patient a year before he applied for treatment; palpitation had been present for three years; the thyroid gland was found to be considerably enlarged, especially on the right side; the exophthalmus was on the same side, the right cornea being 2·5 millimètres to 3 millimètres in advance of the left. Von Graefe's symptom was absent.

Detachment of Retina.—Mr. Maher contributed a second paper on a case of total detachment of the retina, in a boy, aged 8. Divergent squint had been present for four years

before he came under observation. The pupil did not react directly to sight, and but slightly indirectly; extending across the retina, at the upper part, was a thin band of organised lymph. There was no perception of light. The mother was confident that the child had never received any blow on the eye, and that the only injury the eye could have received was at birth, when the forceps had been used. The writer considered that the existence of a band of lymph in the retina pointed to the detachment being of traumatic origin; and, as complete congenital detachment of the retina was probably unknown, he was inclined to think that detachment was due to injury inflicted by the forceps.

Embolism of Central Artery of Retina in Puerperal Septicæmia.—Mr. Simeon Snell.—The patient was a young woman, aged 26. After the birth of her first child, on November 19th, 1885, she was much neglected as to cleanliness by the midwife. Four days later rigors commenced, and symptoms of septicæmia developed. The pulse was 120, and the temperature 103° Fahr. The medical man called in thought the condition very grave at first. During the night of November 27th, sight was suddenly lost in the left eye. She gradually recovered from the septicæmic state, but vision remained lost; and, when first seen by Mr. Snell in January, 1886 (two months after the attack), the appearances in the fundus were those of embolism of the arteria centralis retinæ in a late stage. There was no cardiac disease. Mr. Snell pointed out that the interest of the case lay in its association with puerperal septicæmia. The source of the embolus was doubtful, but in the puerperal state, and in the feeble condition of the patient, simple thrombosis of the heart or pulmonary vessels could easily have occurred.

Mr. Nettleship observed that there seemed to have been an unusual amount of hæmorrhage.

The President suggested that this might be accounted for by supposing that the embolus was probably infective.

Dr. Stephen Mackenzie had never seen a case of embolism of the retina in association with the puerperal state, though embolism in other situations was far from uncommon.

Dr. Anderson said that he had collected statistics which showed that embolism of the left middle cerebral artery was most liable to occur when stenosis of the mitral valve was complicated by pregnancy.

Meningitis after Enucleation.—Dr. Dyce Davidson, Aberdeen—letter read by Dr. Stephen Mackenzie. The patient, a woman, aged 49, had received an injury to the right eye four or five years before the enucleation was performed; the eye had been quiescent for three years until three weeks before she applied for treatment. She was ill-nourished, broken down in health, and much impoverished, but presented no signs of any disease. The urine did not contain albumen. The eye was painful and tender in the ciliary region, and was enucleated three days after admission, antiseptic precautions and a salicylic pad being used. Twenty-four hours later she was in a high fever, had vertical headache and a foul tongue, but the wound was healthy. She died comatose on the third day. The wound looked œdematous at the time of death. At the necropsy meningeal inflammation, with redness of the optic nerve and œdema of the orbit, were observed. All the other organs were healthy except the uterus, which was in a condition of catarrhal inflammation. Dr. Davidson suggested that the case was one of pyæmia, started by this condition of the uterus, and surmised that this suggestion might explain other cases.

Dr. W. A. Brailey asked for further details with regard to local treatment, as he believed that there were important variations with regard to the use of pads.

The President said that he had never met with such a case. He had enucleated over and over again during the acute stage of suppuration, but had never had a case of meningitis.

Mr. Nettleship, for various reasons, thought it was unnecessary to look to the uterus for a source of septic infection; such a supposition, indeed, was directly negatived by the fact that half of the cases of meningitis after enucleation which were on record had occurred in males.

Mr. Warren Tay felt that further particulars with regard to the nature of the meningeal inflammation and the state of the optic nerve, which was not usually affected, were to be desired.

Cataract Extraction.—Mr. Brudenell Carter read a paper on cataract extraction. Referring to a paper by Mr. Critchett, he expressed his concurrence in that writer's remarks about the spring speculum, the entire abandonment of which he had himself advocated, in a note added in the beginning of 1885 to the still unsold copies of his Lettsomian lectures. He did not, however, approve of Mr. Critchett's suggestion to use the third finger of the fixing hand as a lid-elevator, preferring the elevator of Noyes in the hands of a careful assistant. He thought that Mr. Critchett's method unduly restricted both the choice of a fixing-point and also the mobility of the fixing-hand; and he condemned the oblique section which these restraints rendered necessary, on account of its tendency to expose the coloboma iridis, and to produce astigmatism along an oblique corneal meridian. He referred to the application of antiseptic surgery to operations upon the eyes, and advocated the use of a solution, of cocaine ten per cent. and of salicylic acid. Dr. Galezowski's dressing of specially prepared gelatine had not been successful in his hands; and he recommended a compress of wet cotton-wool, placed over a morsel of linen smeared with sanitas-vaseline, and retained by a strip of knitted cotton which was secured by three pairs of strings. As among trifles contributory to perfection, he attached much importance to this method of dressing.

Mr. Anderson Critchett defended the use of the finger in the place of the speculum, because he found it best to make fixation just below the point of counter puncture. The old French toothed forceps used to tear the conjunctiva; he had found the double fixation hook answered well in some cases, but the best instrument was a slight modification of the forceps, used by Mr. Bell Taylor: with this instrument, a few fibres of the sclerotic could be pinched up, and a firm hold got upon the eye at any point. Holding the eye at the point where the counter puncture was to be made, the section could be made of any size. It was impossible for the assistant to work in perfect harmony with the operator, and, at the critical moment when spasm was coming on, valuable time might be lost. Where the operator depended entirely upon himself, the very first commencement of a spasm could be felt, and the finger relaxed. In completing the section the finger was withdrawn,

the lid closed gently, and there was thus less chance of the lids being squeezed together. With cocain the patient had less control over the lid, and the danger of a squeeze was greater. With regard to the oblique incision, he was in the habit of making his puncture very little below the centre of the pupil, and it was not necessary, as a rule, to remove more than the central portion of the iris. He had not suggested that it was desirable to cut out with one push; three-fourths of the incision might be made with the push, and the remainder in withdrawing. The knife he used was curved, had a central point, and commenced to bulge immediately below, so that, with a steady onward push, it cut its way so far as to complete three-fourths of the section. He referred to the case of an old man, aged 84, in whom he had operated on both eyes simultaneously. In the one eye he had made the incision entirely in the sclerotic; in the other eye he had made it entirely in the cornea. In this he had followed a dictum of his late father, who had always taught that in operating on both eyes simultaneously it was always right to give the patient every chance by choosing a different operation for each eye, for the same person was not equally prone to inflammation in the sclerotic and in the cornea. M. Galezowski, who was present at the operation, provided some of his gelatine discs, which he stated he had used in 107 consecutive cases without a single case of suppuration. In this case, unfortunately, the eye in which the incision was confined to the cornea suppurated with remarkable rapidity; the other eye did very well and sight was good. The case illustrated the wisdom of the late Mr. Critchett's dictum; if the incision had been made in the cornea in both eyes probably both would have been lost.

Mr. Nettleship thought that the very strong solutions of cocaine used by Mr. Carter were dangerous; he used a two per cent. solution. He thought the exact direction of the incision was of small consequence; the incision directly upwards was preferable because it gave the best cosmetic results. Liebreich always made his section downwards entirely in the cornea, and never used a speculum; in his hands the results were good on the whole.

Mr. M. McHardy suggested that it was advisable to put a drop of cocaine in the eye not to be operated on, as spasm was less liable to occur when this was done.

Mr. Hodges had performed Mr. Critchett's operation in several cases, but only in one case without the speculum. He had been pleased with the ease with which the operation could be performed and with the result.

Mr. Brudenell Carter, in reply, said that he had not met with the tendency to spasm with the frequency Mr. Critchett inferred. For fixing, he preferred a pair of forceps with a broad, flat point, and with at least three or four teeth. The advantages of the meridional fixing-point were considerable, and he thought it important to have freedom of movement in the fixing hand. The cocaine solution contained salicylic acid; it was thus antiseptic, and it had the advantage that in washing the eye the cocaine was not all washed away.

Living and Card Cases.—Mr. W. P. Kiall (Bristol): a boy, in whom evisceration of the eyeball was performed, and a hollow silver ball introduced. The boy had subsequently received a blow, followed by a "black eye," but without any other consequences.

Mr. W. Lang: a young woman, in whom evisceration was performed, and a glass ball inserted in the manner recommended by Mr. Mules. A glass eye had been fitted, and the movements were fairly good.

Mr. Snell: Stamp for indicating axis of cylindrical lens.

Mr. J. B. Lawford: New tissue formation in choroid (and retina?), following injury, probably rupture.

Mr. Marcus Gunn: a woman, who had presented for many years symptoms of locomotor ataxy, and exophthalmic goître fourteen years, in whom marked pigmentation (? Addison's disease) had recently developed.

ON INSUFFICIENCY OF THE POWER OF CONVERGENCE.

By Dr. E. Landolt, Paris.

[Translated under the author's direction by W. T. Law, M.D., F.R.C.S.]

For the proper accomplishment of binocular vision two conditions are necessary:—1. The image of the object must be simultaneously formed upon the fovea centralis of each eye. 2. This image must be distinct.

The first condition is fulfilled when the visual lines cross at the point of fixation. This depends upon the *motor apparatus*, whose function is to give to the eyes the convergence required by the distance of the object. The realisation of the second condition concerns the *optical apparatus* of the eyes.

Of these two elements of binocular vision, the former is by far the more important. Without proper direction of the eyes such vision is absolutely impossible, while it may very often be effected satisfactorily to the individual, in spite of imperfection of the retinal images. Moreover, it is very easy to correct optical errors by glasses, while it is much more difficult to remedy a defect of movement or direction in the eyes. Alterations in the latter are very frequent. They often give rise to an asthenopia, in the treatment of which there is yet much to be desired, for we are still far from sufficiently understanding the functions of the motor apparatus in relation to binocular vision, or the means of correcting their anomalies. For a long time I have studied this important question, and would here venture to give a resumé of the results at which I have at present arrived. Should these, however, fail to solve the numerous questions connected with the subject, I hope they may at least help to point out the way of conducting the investigation.

For simplicity's sake I have called by the term *convergence** the faculty of simultaneously directing the two

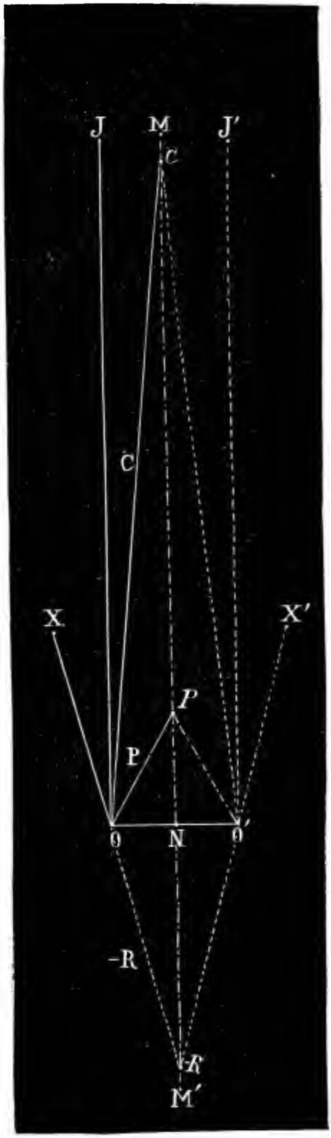

FIG. 1.

* Landolt. Refraction and Accommodation, p. 185–194. Young J. Pentland. Edinburgh. 1886.

eyes to the object of fixation, whether the distance be finite, infinite, or even beyond infinity. The most natural method of measuring the convergence is by means of a fixed object placed in the median line (M M', Fig. 1.) In this way the *angle of convergence* is always the same for each eye. This angle necessarily affords the measure of the convergence effort put forth by each eye. In distant vision, the two eyes (O and O') having a parallel direction, this angle is nil. It increases in proportion as the object fixed is brought nearer. It may be said then that the size of the angle of convergence is in *inverse* proportion to the distance between either eye and the fixed object in the median line.* If the object be at C at the distance O C=C, the angle of convergence J O C can be expressed by $C = \frac{1}{C}$. In measuring this distance C by the aid of the metre we obtain for the convergence required in binocular fixation an expression identical with that of the refraction necessary for distinct vision of the same object. Thus, supposing an object be situated at a distance of one metre from each eye there must be for both eyes $\frac{1}{1m} = 1$ dioptry of positive refraction and $\frac{1}{1m} = 1$ unit of positive convergence. This unit is called, after Nagel, to whom we are indebted for this principle of measurement, the *metre angle.*† If the object is placed at $\frac{1}{3}$ metre from each eye $\frac{1}{1m/3} = 3$D and 3*m. a.* are required, and so on.

The *amplitude* of convergence is obviously contained between the maximum and minimum of the convergence which an individual is capable of exerting.

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* In reality the inverse of the distance does not give the *angle* of convergence but its sine; for our purpose, however, we may conveniently substitute one for the other.

† An expression analogous with *metre lens*, which Nagel has proposed for the dioptry. The *absolute* value of the metre angle depends upon the distance which separates the centres of rotation of the eyeballs from each other. For instance, if this, the base line, is 58 mm. in length, the metre angle $= 1° 39' 39''$. If 64 mm. the metre angle will $= 1° 50'$ and so on.—Nagel in Graefe-Saemisch, Handbuch VI., p. 478.

The *maximum* of convergence is inversely as the distance of the nearest point, *punctum proximum of convergence*, which can be fixed binocularly. If P be the distance which separates this point from each eye, the maximum of convergence is $= \frac{1}{P}$. In measuring the distance P by means of the metre we can replace this fraction by the value p metre angles.

The *minimum of convergence*, upon the same principle, is inversely proportional to the distance which separates each eye from the *furthest* point, which can be fixed binocularly. If R be the distance of this *punctum remotum of convergence*, the minimum of convergence will be $\frac{1}{R} = r\ m.a.$ If this point be situated at a *finite* distance, the minimum of convergence is *positive*, and can be determined in the same manner as the maximum, as I shall explain hereafter. But this only happens in pathological cases. Under normal conditions the lines of fixation can at least be directed parallel with each other. The minimum of convergence in such a case is equal to zero, because the punctum remotum is situated at infinity and $r = \frac{1}{\infty} = O$. Most normal eyes, however, can *diverge* more or less. The minimum of convergence is then *negative*. It is always inversely proportional to the distance of the punctum remotum, only as the lines of fixation diverge this point is not situated in front of the head but behind it—*R* (Fig. 1), where the lines of fixation, prolonged backwards, meet.

The amplitude of convergence (a) is represented by the difference between the maximum and the minimum of this function : $a = p - r$. In normal cases I have found on an average that the minimum of convergence is about -1 *m. a.;* the maximum 9·5 *m. a.;* and the amplitude of convergence therefore 10·5 *m. a.*

When the minimum of convergence is *negative*, its amount is measured by the strongest abducting prism, which can be overcome in distant vision. Nothing is easier than to express in metre angles the effect of a prism. The exact calculations have been given

by Nagel, and, also, in my own work.* In practice it is sufficiently accurate to divide the number of the prism by 7 to obtain, in metre angles, the deflection required to overcome it. (The distance between the centres of rotation of the two eyeballs in this case is taken as between 58 and 64 mm.) A prism of 14° held horizontally before *one* eye, requires from *each* a rotation of $\frac{14}{7} = 2$ *m.a.*, *adduction* if the edge of the prism is turned inwards, *abduction* if outwards. Anyone who in distant vision can overcome a prism of 5° has a minimum of convergence $- r = \frac{5}{7} = \cdot 71$ *m. a.*

When we desire to ascertain whether a patient's power of converging is sufficient or not, p should be taken as the starting point of our investigation. But in order to determine whether asthenopia is due to insufficiency of this function we must know, first of all, how much convergence the individual requires for his work. This important point is not easily ascertained, and, strange to say, seems to have been entirely overlooked. For vision at a distance of $\frac{1m}{3}$, 3 *m. a.* of convergence are essential. If, however, an individual's utmost capacity for convergence does not exceed this amount; in other words, if his punctum proximum of convergence is situated at $\frac{1m}{3}$, continuous work at that distance will be impossible. For sustained effort a reserve of convergence power is necessary to replace what is expended in work. Only when we have gauged this reserve fund of strength can we tell with certainty whether the patient has motor-asthenopia or not, and if so, by how many metre angles he fails to reach the required standard. It is evident that this reserve power cannot be an absolute quantity (for instance, 2 *m. a.*) in all cases, but that it must represent a tolerably constant proportion of the total amount. My experience seems to show that this reserve force must be at least twice as great as the convergence employed. Thus in order to work at a distance of one metre, that is to

* Landolt, l. c., p. 194.

say, with 1 *m. a.*, I must have 2 *m. a.* in reserve, making a total of 3 *m. a.* Again, to continuously converge to $\frac{1m}{4}$, $3 \times 4 = 12$ *m. a.* are wanted.

In order to decide whether asthenopia results from want of power of converging, I first learn the distance at which the patient requires to work, and then place his refraction in the most favourable condition for this purpose. Suppose the working distance to be $\frac{1m}{3}$, I ascertain if he possesses $3 \times 3 = 9$ *m. a.* of positive convergence. If he has 10 or 11 *m. a.*, there is no fear of muscular asthenopia. 9 *m. a.* would be just on the border line, but if p is less than 9 *m. a.*, for instance only 7, the patient has at least $9-7=2$ *m. a.* too little.

Now comes the question, how can we compensate this deficiency of convergence power, and cure the asthenopia? First of all, *prismatic glasses* occur to our minds. Their necessary strength can be calculated from my previous remarks. One metre angle is equivalent to a prism of 7° for one eye, or 3·5° for both. Therefore, assuming as in our example a deficiency of 2 metre angles, it would be requisite to place prisms of 7° before both eyes. For well-known reasons, however, prisms of this strength cannot be employed in practice. For spectacles we are not able to exceed prisms of 5°, which will only correct a failure of 1·4 *m. a.*

When, therefore, the insufficiency exceeds 1·5 *m. a.*, we should avoid tiring the patient with optical appliances, and if by rest and hygienic measures no improvement results, we must resort to *surgery*. We have to take into consideration the question of performing either tenotomy of the external recti,* advancement of the internal,† or a combination of the two operations. It is highly interesting to observe the effect of these procedures upon the range of convergence and its composition (as regards its maximum and minimum elements). Before entering

* For details of method of operation I adopt, see *loc. cit.*, p. 402.

† *Loc. cit.*, p. 406.

upon this, however, it is time we should more closely consider the nature of the disease, for upon this depends the result of our operations.

Everyone acquainted with muscular or motor asthenopia must be aware that there exist two distinct forms of the affection. Von Graefe has already shown this, and A. Graefe has further developed the subject in his valuable work on "Motilitaetsstörungen." Krenchel's interesting essay, too, on the same subject is generally known; the most accurate of all, however, are the views of my friend Horner, of Zürich.

Of the two recognised varieties of motor-asthenopia, one may be termed *peripheral*, the other *central*. The

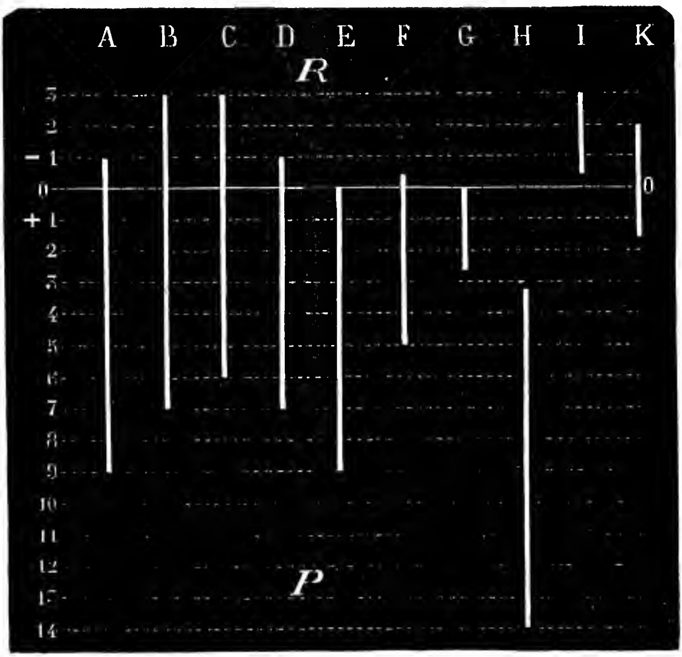

FIG. 2.

first can be called muscular asthenopia in the true sense of the words, being dependent upon the absolute or

relative power of the adductor muscles, upon their insertions. The second variety has a central cause, and arises from a disturbance of innervation of the muscles of convergence, or in the power of fusion. We need not be surprised to frequently find that the associated movements are normal in such cases, for, without doubt, the function of convergence is controlled by a special nervous centre. My experience goes to show, although I cannot yet assert it with absolute certainty, that these two forms are characterised by the mode in which the range of convergence is affected. This may occur in various ways, as is shown in the foregoing schema.* In this diagram the range of convergence is represented by the vertical lines; the full horizontal line indicating zero. Those parts of the vertical lines above the horizontal stand for the negative part of the convergence; those beneath for the positive portion. The dotted lines and the figures indicate metre angles. At A is shown the normal condition in which the positive convergence (p) is about nine times as great as the negative (– r.) It may happen that the entire range of convergence is removed to the negative side. In this case – r becomes greater, and p proportionately less, as at B. Such a condition may arise simply from excessive strength of the abductors, without either muscular insufficiency or disturbance of innervation of the internal recti, tenotomy of one, or, if necessary, both of the externi, gives very good results in these cases.

CASE 1.—Strong man, æt. thirty.

$$\left.\begin{array}{lll} \text{Left.} & \text{Myopia} & = 6\text{ D} \\ \text{Right.} & \text{,,} & = 7\text{ D} \end{array}\right\} \text{Astig. } 1{\cdot}25\text{ D in both eyes.}$$

Acuteness of vision both sides normal.

Muscular asthenopia.

$$\left.\begin{array}{l} p = 7 \\ r = -3 \end{array}\right\} a = 10\,m.a. \quad \text{(Fig. 3, left line.)}$$

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* Landolt, l. c., p. 502.

Three days after *tenotomy* of one external rectus I found

$$\left.\begin{array}{l} p = 12 \\ r = -1 \end{array}\right\} a = 13\ m.\ a.$$

Fig. 3.

The asthenopia entirely disappeared, and after more than a year it was found that

$$\left.\begin{array}{l} p = 12 \\ r = -2 \end{array}\right\} a = 14\ m.\ a.\ \text{(Fig. 3, right line.)}$$

Favourable results may thus be obtained from tenotomy even in cases where a decided diminution in the range of convergence is present, provided it be not excessive, and that the positive part only be affected (Fig. 2, C). But here advancement of the internal rectus appears also to answer very well.

Case 2.—Post office employé, æt. fifty.

$$\begin{array}{l} L : H = \cdot 75\ D;\ V = \cdot 5 - \cdot 6. \\ R : H = \cdot 75\ D;\ V = \cdot 7 \end{array}$$

Amplitude of accommodation = 2·5 D

Uses convex 2·5 D.

Muscular asthenopia.

$$\left.\begin{array}{l} p = 7 \\ r = -1 \end{array}\right\} a = 8\,m.\,a.$$

Tenotomy of the right external rectus; no suture. Immediately after the operation

$$p = \text{about } 15\,m.\,a.$$
$$r = \text{,,} \quad -\cdot 5\,m.\,a.$$

Ten weeks after the operation

$$\left.\begin{array}{l} p = 10 \\ r = -1\cdot 25 \end{array}\right\} a = 11\cdot 25\,m.\,a.$$

CASE 3.—Teacher, aged between twenty and thirty. Very good constitution.

L and R : H = ·5 ; V = 1.

FIG. 4.

Accommodation normal. Very pronounced muscular asthenopia.

$$\left.\begin{array}{l} p = 3\cdot 5\,m.\,a. \\ r = -2\cdot 5\,m.\,a. \end{array}\right\} a = 6\,m.\,a. \quad \text{(Fig. 4, left line.)}$$

Free *tenotomy* of the right external rectus; no suture. Both eyes bandaged. The following day

$$\left.\begin{array}{l} p = 10\ m.a. \\ r = -1{\cdot}25\ m.a. \end{array}\right\} a = 11{\cdot}25\ m.a.$$

Ordinary exercise of convergence. Eighteen days after the operation

$$\left.\begin{array}{l} p = \ \ 15 \\ r = -2 \end{array}\right\} a = 17\ m.a. \text{ (Fig. 4, right line.)}$$

FIG. 5.

Fields of fixation:

Left.	Right.
Temporal, 50°.	Temporal, 45°.
Nasal, 45°.	Nasal, 50°.

Asthenopia cured.

Case 4.—Boy, æt. thirteen.

L and R myopia = 1·25 D.

V = ·7 and 1 respectively.

Muscular asthenopia.

$$\left.\begin{array}{l} p = 3{\cdot}25 \\ r = -2{\cdot}3 \end{array}\right\} a = 5{\cdot}5\ m.\,a. \quad \text{(Fig. 5, left line.)}$$

Advancement of one internal rectus. After more than a year

$$\left.\begin{array}{l} p = \text{more than } 20 \\ r = -2 \end{array}\right\} a = 22\ m.\,a. \text{ (at least).}$$

(Fig. 5, right line.)

Case 5.—Woman, æt. thirty-five.

L : hypermetropia = ·75 D : V = ·7.

R : ditto = ·5 D ; V = ·8 to ·9.

Muscular asthenopia.

$$\left.\begin{array}{l} p = 7 \\ r = -1 \end{array}\right\} a = 8\ m.\,a.$$

Advancement of one internal rectus. Six days after we found

$$\left.\begin{array}{l} p = 14 \\ r = -1{\cdot}5 \end{array}\right\} a = 15{\cdot}5\ m.\,a.$$

The asthenopia was cured. In this case, before the operation, I found both fields of fixation somewhat contracted, especially at the inner side.

When the positive part of the convergence range is shortened, the negative being of normal extent, tenotomy may, as I have already stated, be advantageously practised, but if − r be diminished to ·5 *m. a.* or less, advancement of the tendon is undoubtedly preferable.

When both positive and negative parts of the amplitude of convergence are considerably shortened, as shown at F and G of the schema (Fig. 2), we usually have to deal with the second or *neuropathic* form of insufficiency, which is characterised by a noticeable diminution of the range of convergence.

Similar conditions are met with, it is true, in high myopes, in whom, in consequence of enlargement of the eyeball, the muscles being unduly stretched, lose their elasticity, and are also impeded in action owing to the divergent position of the globes. In such patients, the range of convergence may be reduced to less than 3 *m. a.*,

without − r having much increased. Any operation for cases like these gives most unsatisfactory results, as I have pointed out elsewhere.* Instead of increasing the range of movement it lessens it still more.

CASE 6.—Young man, æt. twenty-five.

Myopia = 18 D and 20 D.

Eyeballs considerably enlarged, divergent, and restricted in movement.

$$\left.\begin{array}{l} p = \ \ 1{\cdot}5 \\ r = -2 \end{array}\right\} a = 3{\cdot}5\ m.\ a.$$

Tenotomy of one external rectus. In a week or two the condition was—

$$\left.\begin{array}{l} p = \ \ 7 \\ r = +4 \end{array}\right\} a = 3\ m.\ a.$$

Thus the patient had still insufficient convergence for near work, while he had excess, *i.e.*, convergent strabismus with homonymous diplopia, for distance; besides which the range of movement was actually less than before the operation. Later on, after a moderate tenotomy of one internus, he lost his strabismus, and r became = O, but the punctum proximum receded till p = 2·5 *m. a.* only. The amplitude of convergence was thus reduced to 2·5 *m. a.*

Such cases can easily be distinguished from the neurasthenic class, however. This latter, while exhibiting considerable lessening of the range of convergence, presents no peculiar abnormality in either the form of the eyeball, the refraction, or the associated movements. The treatment of this class of cases is extremely difficult, for where we often have to deal with a deficiency of convergence of 6 *m. a.* and more, prisms are out of the question, while muscular advancement, the operation commonly to be chosen on account of the small extent of the negative r, is attended with only temporary benefit. Exercise of the affected organs, as A. von Graefe† properly observes, would only increase the weakness of the affected muscles by tiring them. We shall gain

* *Loc. cit.*, p. 512.

† A. von Graefe in Archiv. of Ophth. viii., 2, p. 345, 1862.

most from ocular hygiene and attention to the general health, though I would not entirely exclude, in suitable cases, all operative aid or prisms. The two following cases are characteristic examples of the neuropathic form of motor asthenopia.

CASE 7.—A young nun.

$$\left.\begin{array}{l} \text{L : myopia} = 2{\cdot}25\ \text{D} \\ \text{R : } \quad \text{do.} = 2{\cdot}75\ \text{D} \end{array}\right\} \ \text{V} = 1.$$

Asthenopia of high degree. When the eyes were quiescent there was divergent strabismus of 5°.

p did not exceed 1 *m. a.*

In the course of five months I successively advanced both interni, and tenotomised both externi; the immediate effect was, on each occasion, very good, and for some time there was even considerable convergent strabismus with homonymous diplopia, which, after a time, passed off, as did also, for a while, the asthenopia; nevertheless, at this moment,

$$\left.\begin{array}{l} \text{p is only} = \ \ 4 \\ \text{r} \qquad\quad\ = -2 \end{array}\right\} \ \text{a} = 6\ \textit{m. a.}$$

Both apparent divergent strabismus and asthenopia still persist to a certain extent. It would be impossible to find a better instance of remarkable reduction of the power of convergence or fusion. The insertion of the externi has visibly receded, while the interni have become attached close to the corneal margin. The operations performed would have sufficed to cure the highest degree of external squint, but, notwithstanding this, the eyes can only converge to a distance of ¼ metre, while they have regained their former condition of divergence. The field of fixation is almost normal in the horizontal plane, though, perhaps, slightly increased internally. Still more instructive is the following:—

CASE 8.—A young teacher who observes and answers very accurately. There is general weakness of the muscular system.

$$\text{L : myopia} = 1{\cdot}5\ \text{D}; \ \text{V} = 1.$$
$$\text{R : do.} \quad = 2\ \text{D}; \ \text{V} = {\cdot}8$$

Motor asthenopia which prevents him working for more than four hours daily. Fields of fixation somewhat limited in every direction.

$$\left.\begin{array}{l} \text{p} = \ \ 4{\cdot}5 \\ \text{r} = -{\cdot}5 \end{array}\right\} \ \text{a} = 5\ \textit{m. a.}$$

Advancement of one rectus internus. Four days after the operation

$$p = \text{more than } 20 \; m.\,a.$$
$$r = + 1{\cdot}5 \; m.\,a.$$

There was, therefore, over-correction.* During the next few days positive convergence for distance even increased, whereas for near vision it diminished. But, after a time, the former disappeared entirely, the patient was no longer troubled with diplopia, and he could work easily without abducting glasses. In three months' time, however, the old asthenopic trouble reappeared. He then again took to prismatic glasses, which gave him temporary relief, but eventually he came back again to me, and examination frequently repeated showed—

$$\left.\begin{array}{l} p = 4 \\ r = -{\cdot}5 \end{array}\right\} \; a = 4{\cdot}5 \; m.\,a.$$

The patient's condition is thus the same as before the operation.

Let me quote another striking example of neurasthenic muscular asthenopia in

CASE 9.—Young girl, æt. 20.

L : M 2·75 D; V = 1.
R : M 2·75 D; V = 1.

With the ophthalmoscope the actual myopia proved to be = 2·5 D.

Muscular asthenopia.

Tenotomy of the right external rectus. Immediately after the operation

$$\left.\begin{array}{l} p = 15 \\ r = + 2{\cdot}5 \end{array}\right\} \; a = 12{\cdot}5 \; m.\,a.$$

Conjunctival suture so that r was reduced to 0 *m. a.* The next day

$$\left.\begin{array}{l} p = 15 \\ r = 0 \end{array}\right\} \; a = 15 \; m.\,a.$$

Suture removed.

Patient was able to work, free from asthenopic troubles, for a

* The state of affairs here is shown at II in diagram 2, where the entire range of convergence is situated in the positive region. This is especially met with in cases of paralytic convergent strabismus. I (Fig. 2) illustrates the opposite condition, occurring in divergent squint, where convergence is entirely confined to the negative region.

time, but eleven months later she returned with the same complaint. The amplitude of convergence was as follows :—

$$\left.\begin{array}{l} p = 3 \\ r = -\cdot 5 \end{array}\right\} a = 3\cdot 5 \ m. a.$$

A treatment consisting of hygienic strengthening measures was then ordered, but, notwithstanding, the amplitude of convergence continued to diminish, and consequently the asthenopia increased. Nine months after the examination cited, twenty months after the first operation, we found

$$\left.\begin{array}{l} p = 1\cdot 75 \\ r = -1\cdot 75 \end{array}\right\} a = 3\cdot 5 \ m.a. \text{ (Fig. 6, first line.)}$$

Fields of fixation:

Left and right nasal 49°.
temporal 50°.

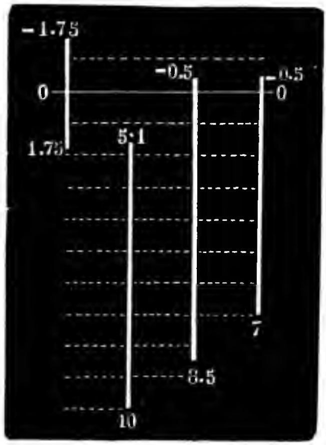

FIG. 6.

Advancement with a slight resection of the internal rectus of the right eye was then performed. Both eyes were bandaged for five days, when the sutures were removed and the eye operated on alone bandaged. Two days after the operation there was

$$\left.\begin{array}{l} p = 10 \\ r = +1\cdot 5 \end{array}\right\} a = 8\cdot 5 \ m.a. \text{ (Fig. 6, second line.)}$$

Ten days after the operation

$$\left.\begin{array}{l} p = 8\cdot 5 \\ r = -0\cdot 5 \end{array}\right\} a = 9 \ m. a. \text{ (Fig. 6, third line.)}$$

We had therefore gained $9 - 3{\cdot}5 = 5{\cdot}5$ *m. a.* of amplitude of convergence, and increased the positive part from $1{\cdot}75$ to $8{\cdot}5$ *m. a.*

This amount would have sufficed for near work, at least. with the help of weak prismatic glasses.

But the power of convergence still shows a tendency to decrease, so that four days ago, that is to say, three weeks after the advancement, I found

$$\left.\begin{array}{l} p = 7 \\ r = -{\cdot}5 \end{array}\right\} a = 7{\cdot}5 m.a. \text{ (Fig. 6, fourth line.)}$$

It is highly important to note that this patient belongs to a family subject to neurotic troubles. Her mother was anæmic and very "nervous" from the age of twelve to fourteen. She had convulsive attacks affecting the upper extremities, which necessitated confinement to bed. A great aunt suffers from hysterical crises and contortions. The patient herself developed neurotic symptoms at the age of fourteen. She grew impatient in temper, had typical globus hystericus daily, lasting about four hours, from the seventeenth to the twentieth year, fits of laughing and crying, palpitations, and, a fortnight ago, anæsthesia of the legs succeeded an emotional outburst. At the same time, walking was very difficult. The latter symptoms have spontaneously and suddenly disappeared. The left (non-operated on) eye she says is becoming sometimes very painful under the influence of emotion, without presenting any objective symptom.

I am not unmindful of the fact that not only may absolute insufficiency of convergence or accommodation cause asthenopia, but that the affection may arise in cases where either function, taken by itself, being normal, there occurs inco-ordination in their combined action. In other words, with a normal *absolute* range of convergence and accommodation the *relative* range of these functions may be affected.

This happens, for instance, in young hypermetropes in whom insufficient relative range of accommodation leads to excess of convergence—squint, in fact. This, of course, is not insufficiency of convergence, but rather

its opposite. The treatment of this relative and frequently also absolute insufficiency of accommodation is well understood.

On the other hand, it is possible, especially with myopes, that the correct convergence calls forth an excess of accommodation. A myope requires to bring into play less accommodation in proportion to his ametropia than the emmetrope; but it happens that he cannot sufficiently separate the two functions from

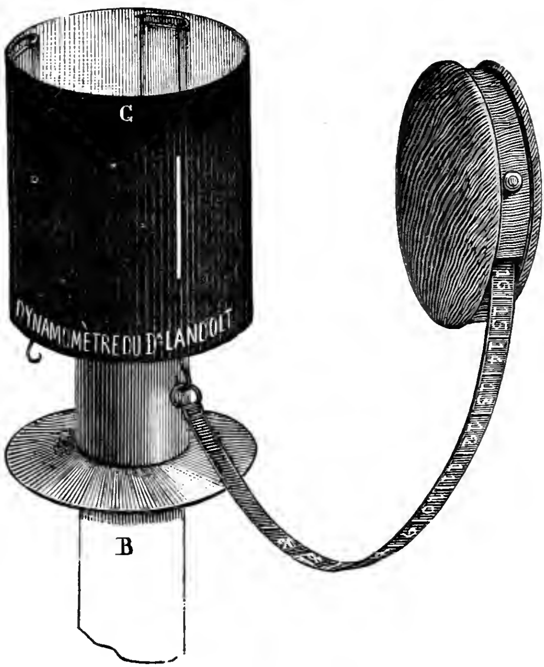

Fig. 7.

one another, and that with a given degree of convergence he associates too great an amount of accommodation. From the point of view of the accommodation such cases could be regarded as examples of insufficiency of convergence, or rather of the positive part of the relative

range of convergence.* If, however, the absolute convergence is normal, it appears to me incorrect to speak in such cases of insufficiency of convergence. As to treatment, I should decline to operate, especially since for distance we generally find even the relative convergence normal. Cases like these are more correctly considered as instances of excess of the positive part of the relative range of accommodation. They may be called and treated as spasm.

The diagnosis of these different cases is easily established by use of my dynamometer.

The Ophthalmodynamometer.

This little instrument consists of a cylinder (C, fig. 7) which can be fixed to any candle of ordinary size. It possesses (1) a vertical slit of about ·3 mm. in breadth, (2) a vertical line consisting of a series of fine openings, (3) a circular aperture of about 1 mm. diameter. The openings are all covered with ground glass, and when the candle is lighted they form shining objects, thrown into sharp contrast with the blackened exterior of the cylinder. Under each opening is placed a hook, to which can be attached the end of a measuring tape constructed to wind up by a spring in the ordinary way. This tape is divided into centimetres one side, beginning from its free end, and on the other side into the corresponding value in metre angles or dioptries as the case may be. Thus the numbers, 16, 15, 14, &c., in the diagram (Fig. 7) stand for centimetres ; 20 and 18 indicate metre angles or dioptries. 11 cm. would thus correspond with 9 D or 9 *m.a.*, 20 metre angles with 5 cm., and so on.

To ascertain the maximum of convergence, the tape being partly withdrawn, its case is held at the outer margin of the orbit, so that the aperture through which the tape issues is on a level with the point of rotation of the eyeball. The patient is then told to look at the

* Landolt. Loc. cit., p. 283.

vertical line upon the cylinder, and the instrument is gradually brought nearer in the median line, until he says the line appears double (crossed diplopia). The measure is then removed, and the distance of the punctum proximum read off on one side of the tape, and the maximum of convergence upon the other. We must, of course, make sure that the patient fixes the object with both eyes, and it is therefore desirable to watch his movements so as to see that he really follows its approach. For persons who are unable to decide readily whether they see double or not, we may use coloured glass at first, which can be afterwards dispensed with.

As muscles, especially those of the eye, do not contract with mathematical precision, it is indispensable that we should repeat the examination several times in succession, and upon different occasions. I, myself, never operate until I have ascertained the degree of insufficiency accurately by making repeated examinations and at different times.

Lastly, it is advisable to begin the approximation of the light from a distance considerably further from the patient than his punctum proximum, and not to commence by placing the light close to the nose, because, while in the former case it is easy for him to increase his convergence gradually as the light approaches, in the latter he generally overcomes the commencing crossed diplopia only when his punctum proximum is considerably passed.

It sometimes happens, however, that persons can converge up to the point of the nose, to a shorter distance, in fact, than the object can be brought within, and that their punctum proximum of convergence is so close that we cannot ascertain the precise maximum within one or two metre angles. These cases have, however, no practical interest, for when the power of convergence exceeds 16 *m. a.*, it is, at any rate, not insufficient. For experimental purposes, we can adopt

means similar to those employed where the accommodation near point is unusually close, for, just as in the latter instance, by employing concave lenses the punctum proximum can be put further away artificially, so where convergence is concerned the near point may be removed to a greater distance by adducting prisms. The value of the prisms in metre angles being added, of course, to the so-found p.

The *minimum* of convergence, if positive, can also be estimated with the dynamometer, and will be found to be in inverse ratio to the greatest distance at which the bright line can be perceived as a single object. Should homonymous diplopia begin at only two metres distance so that r is less than half metre angle, the flame alone may be used, as the aperture forms too fine an object, but this very seldom happens.

To define the range of accommodation, the fine openings of the apparatus are used. These are gradually brought nearer the patient, till they appear indistinct, and the result is read off on the tape in dioptries instead of metre angles, and the maximum of refraction in the place of maximum of convergence. When a person is emmetropic, the maximum of refraction of which he is capable is equal to the range of accommodation.

The same line of bright points may be used in investigating the relations existing between the converging or motor and the accommodative or optical apparatus of the eyes. When convergence and accommodation harmonise the patient will be able to distinctly see the row of luminous points as such. If convergence be at fault, the line will appear double, the diplopia being crossed if there be insufficiency, or homonymous if excess. Should there be any failure in the optical adaptation, especially error of accommodation, the points will appear blurred. The kind and amount of error—that is to say, the differential diagnosis between excess and deficiency of accommodation, can then be estimated by trial lenses in the usual way.

The circular aperture of the dynamometer is useful in the analysis of all possible kinds of derangements of motility which are accompanied by diplopia.

The case also contains a little frame (18×25 mm.) with a handle in which threads, hairs, small objects, such as printed letters, or a diaphragm with fine holes, can be placed to define the range of accommodation.*

NOTES OF CASE OF CEREBRAL ABSCESS, SUBSEQUENT TO ORBITAL PERIOSTITIS

By J. Crawford Renton, M.D. Ed.,

Surgeon to the Eye Infirmary, and Surgeon to the Dispensary of the Western Infirmary, Glasgow.

D. D., aged 12, was admitted to the Glasgow Eye Infirmary on 17th October, 1884, suffering from what appeared to be right orbital cellulitis of ten days' duration.

October 22nd.—Free incision was made along inner side of upper eyelid; a considerable quantity of pus evacuated, and a drainage tube inserted.

October 26th.—Discharge ceased, swelling gone, and patient was so well that he was recommended to go home in two days. On 28th October, however, he complained of severe pain in his head, intermittent in character, and most severe over the right temporal region. Vision normal. Ophthalmoscopic examination showed a normal fundus. No evidence of any fresh formation of pus in the tissues around the eye, but the wound was re-opened, and a probe passed along it, but without detecting any bare bone; the drainage tube was re-inserted. Ice applied to the head, and small doses of calomel given internally. Pulse 64, and temperature normal. The pain continued with great severity, accompanied with vomiting, until 1st November, when complete relief took place, and patient was quite well until 4th November, when the pain returned, and continued to increase in severity until 11th

* The little instrument can be obtained from Pickard and Curry, 195, Gt. Portland St., W.; Roulot, Optician, 58, Quai des Orfèvres, Paris; and Meyrowitz Bros., 295, Fourth Avenue, New York.

November, when he was seized with spasms of the left side, which rapidly became general, and continued until he died at 8.30 p m.

During his illness, the pulse varied from 76 to 52, and the temperature was never higher than 99°, being generally 97·6°. Dr. Ramsay made a *post-mortem* examination, and the following is his report:—

On removing the calvarium, the dura mater presented a normal appearance, but when the surface of the cerebrum was exposed, the convolutions over the right frontal lobe were seen to be slightly flatter than those over the corresponding parts on the left side. The brain was easily removed from the interior of the skull, and on making an examination of the right orbit from above, the orbital plate was found to be extensively necrosed, and almost perforated about its middle, and over that part, and there only, the dura mater was inflamed.

On making an antero-posterior section through the right hemisphere, an abscess was laid open, occupying the anterior half of the frontal lobe, the brain substance of which was in great part destroyed, the abscess cavity was lined by a distinct membrane, and filled with thick fœtid pus, and although at a considerable distance from the surface of the brain, was only separated from the dura mater by a very thin layer of cerebral substance. There was therefore no direct communication between the pus from the orbit and the cerebral abscess.

On making longitudinal incisions through the left cerebral hemisphere nothing abnormal was revealed. The right eye was examined and found healthy.

Two secondary diseases follow suppuration in the orbit—meningitis and abscess. The diagnosis in the case detailed was difficult (1) on account of the absence, when the boy was admitted, of the very acute symptoms which characterise orbital periostitis; (2) the cellulitis subsided, the discharge ceased, and on examination with a probe no bone was felt; (3) there was no previous history of ill-health, and nothing to point to chronic, bone, or brain disease; (4) the symptoms, headache, vomiting, relapses, partial and general

convulsions, seemed to indicate a meningitis of an acute type, and this was the opinion given; the absence of fever is noted in meningitis as well as in other forms of brain disease; (5) the state of vision being normal, with no evidence of optic neuritis, which is generally found in abscess, further confirmed our opinion.

The one point that ought to have put us on our guard was the fact that the pain was most intense over the right temple, and that abscess is more frequently associated with orbital disease than meningitis. We learn more, however, by mistakes than successes.

Had the diagnosis in this case been an abscess, the question of trephining the skull, opening and draining the abscess would certainly have been considered, and would have been the best treatment towards saving the patient's life.

ON UNIFORMITY IN THE DESIGNATION OF THE MERIDIAN IN ASTIGMATISM.

By H. R. Swanzy, F.R.C.S.I. Dublin.

The variety of methods which are in use for the designation of the position of the meridians of greatest and least curvature of the cornea, and of the position of the axis of the correcting cylindrical lens, is a matter which leads to some confusion and inconvenience in ophthalmic practice, and it would seem desirable that a uniform method should be decided on. Not only is there a lack of uniformity in this respect between different countries, but in each country, and even in each city or town, various methods are employed. In communications passing between ophthalmic surgeons, in the noting of their cases, and in their published papers,

this state of affairs is the cause of annoyance and confusion; while the public are liable to suffer owing to errors on the part of the optician, who may get a scription paper with a designation of the meridian different from that to which he is accustomed to work. True, the latter difficulty is, as a rule, got over by means of a diagram, either on the prescription paper supplied by the optician to the ophthalmic surgeon, or on the surgeon's own private prescription paper; but it would be quite possible to attain the same end with equal accuracy by means of less elaborate prescription papers, or upon an ordinary sheet of note paper, were there only a common understanding on the point. I think all will agree that we should endeavour to make our methods of functional examination, and our systems for noting the results obtained, as simple and as uniform as is compatible with accuracy; and, therefore, I trust it is not too much to hope for, that our Ophthalmological Society may take action in this matter, so that, if an international system cannot at present be arrived at—although perhaps at the coming International Congress this might be accomplished—we may at least be in accord with one another in the United Kingdom.

I find there are at least five systems in use in the United Kingdom for indicating the position of the axis of a cylindrical lens in a spectacle frame. It is, comparatively, of little consequence which of these is adopted, provided it be the only plan. But there is one system which in itself has much that gives it a preference, and which has, moreover, the advantage of being the system most generally in use in the United States, as would seem from Knapp's recent paper in the Archives of Ophthalmology (June, 1886), and from many other American ophthalmic papers; and hence, the one by the adoption of which we would most nearly approach to an international system; for, so far as I am aware, Continental countries have not any greater uniformity

in this matter than we have. In this method 0° is placed at the right hand end of the horizontal meridian of each eye of the trial frame—the latter being viewed from the front—and 180° at the left hand end, 90° coming at the lower end of the vertical meridian. The great advantage of this plan is, that the position of the axis can be indicated, whichever eye is being dealt with, by merely writing it down in degrees, thus :—"65°," "150°," "10°."

Through the kindness of my friends I have received twenty-seven opticians' papers, from some of the chief centres of ophthalmic practice in the kingdom, and two private prescription papers. An examination of these, and of the Dublin papers, shows that only five of them (two Dublin, two London, one Birmingham) are adapted to the plan just described. The others represent four other plans.

I cannot think there is much intrinsic advantage in the plan proposed by Knapp (see p. 212) for recording the meridians, or axis ; but, if it should ever be adopted as an international or English system, I for my part shall gladly accept it for the sake of uniformity, which is the great point at stake. Knapp's method does not seem so simple as the one already in general use in the States, and the reasons he gives for its employment hardly compensate for this loss in simplicity, even if they be quite sound. When he can definitely ascertain the principal meridians in one eye, and finds difficulty in doing so in the other, he arranges, he says, the axis of the glass for the second eye to correspond as nearly as possible with that for the first ; because, the principal meridians of a normally astigmatic pair of eyes have, as a rule, the same inclination to the meridian plane, and, therefore, they are apt to be symmetrical in abnormal astigmatism. He thinks it is of importance to be able to recognise the existence of this symmetry by a glance at the note of the case, and, consequently, proposes a new plan by which this can be done, although he admits

that, by the old system, this symmetry can be almost as easily recognised by merely observing that one angle is a supplement of the other.

To my mind it is a great pity that any attempt should be made to unsettle the system now fairly well established in the United States, unless the new one proposed has some very special merit indeed.

Still another method is proposed by Javal, and advocated by Schiötz—also in the Archives of Ophthalmology for June, 1886 (see p. 212). I dare not attempt to criticise a method which has the support of two such masters of optometry, and, as I have said of Knapp's proposal so I say of this, if it be introduced as the international or English system, I shall loyally conform to it. Yet, I confess its working seems a little too complicated to make it generally acceptable. Moreover, it apparently involves the abandonment of a very prevalent mental picture in connection with the arrangement of spectacle glasses, which would, I fancy, add somewhat to the difficulty of obtaining general support for it, in that it supposes the spectacle glasses to be viewed from behind instead of from the front, as is usual with us.

I may seem to overestimate the importance of this question. It is, indeed, by no means a vital one. But, although uniformity in the designation of the meridian may, to the minds of some, be a matter of very minor importance, yet, even these will grant, that every small improvement in our methods is worth striving for.

The establishment of a uniform plan would not be attended with much difficulty—not even as much as was experienced in the introduction of the dioptric system—provided it be a simple plan, and provided it be propounded by some recognised central body such as the Ophthalmological Society of the United Kingdom, or (for an international system) by a committee appointed by the Ophthalmological Section of the International Congress.

Hj. Schiötz (Christiana). Method of recording Optometric Examinations. *Translated in Archiv. of Ophthalmology, June, 1886, p. 203.*

Schiötz advocates the plan proposed by Javal, which is briefly as follows: The glasses are regarded from behind as they appear to the wearer, a semicolon separates the two eyes, and the use of letters to designate the eyes is unnecessary, the right being to the right and the left to the left of the semicolon. For the axis, the observer figures to himself a circle divided vertically into two halves, the right provided with a scale of degrees from 0° at the upper end to 180° at the lower. In Javal's method the meridian of highest refraction only is given in astigmatism, so that if a convex cylinder is prescribed the optician has to place its axis parallel to the designated meridian; if a concave, its axis will lie at right angles to the meridian. This method seems more complicated in practice than that proposed by Knapp.

H. Knapp (New York).—Designation of the Meridian in the Determination of Glasses, and of the Visual Field. *Archiv. of Ophthalmology, June, 1886, p. 205.*

Knapp considers that it is desirable to note the symmetry or asymmetry of the two eyes in recording astigmatism and prescribing cylindrical glasses, and accordingly proposes the following method of notation, the letters t and n indicating temporal and nasal. If he wishes to record the fact that the meridian of maximum refraction is inclined in each eye 10° to the nasal side he orders convex cylinders, thus:

Left $+ \frac{1}{18}$c. 10°_{n}; right $+ \frac{1}{18}$c. 10°_{n}.

Concave cylinders thus: Left $- \frac{1}{18}$c. 80°_{t}; right $- \frac{1}{18}$c. $80^{\circ t}$.

The above examples can be written with equal clearness as follows: Left $+ \frac{1}{18}\ 10^{n}$; right $+ \frac{1}{18}\ 10^{n}$.

Left $- \frac{1}{18}\ 80^{t}$; right $- \frac{1}{18}\ 80^{t}$.

The symbols for cylinders and degrees being omitted because the signs for nasal and temporal clearly indicate that we have to do with cylindrical glasses.

B. Remak (Breslau). **One Hundred Cases of Post-Diphtheritic Ocular Paralysis.** *Centralbl. f. Prakt, Augenheilk, June, 1886, p. 161.*

The cases upon which this statistical paper is founded were taken from records of Prof. Hirschberg's Clinic, in Berlin. They occurred during the years 1883, 1884, and the early part of 1885, during which period diphtheria, always common in Berlin, prevailed more extensively than ever before.

The occurrence of true diphtheria, as the cause of the paralysis, was not in all cases certain. In five cases it was definitely made out that the throat affection had been extremely slight, if it had occurred at all. Some observers maintain that a simple non-diphtheritic inflammation of the throat may lead to paralysis of accommodation. The author considers it more probable that diphtheritic poison is in all cases the agent, but that in certain cases, although affecting the nervous system, it may spare the throat.

In one case the paralysis followed the throat ulceration of scarlatina ; it amounted only to a slight paresis, and was, perhaps, merely the expression of muscular debility.

In one case it followed a cough with inflammation of the fauces—possibly a slight laryngeal group.

In ninety cases, in which the point could be determined, the average interval between the outbreak of the diphtheria and the first appearance of ocular paralysis was rather more than three weeks ; the shortest, one ; the longest, six weeks.

With the exception of nine cases, all the patients were children under fourteen years of age.

They were rarely seen at the onset of the paralysis, but usually when it had reached, or already passed, its maximum intensity. The onset appeared usually to be gradual, and the recovery the same. Occasionally, however, it appeared to reach its maximum within twenty-four hours, the customary asthenopic warnings being absent.

The average duration of the affection could not be determined with precision. For the severer cases it is probably several weeks.

The degree of the paralysis varied much ; in the severer cases, eyes previously emmetropic would require glasses of

3 or 4 D. for reading at the ordinary distance ; while hypermetropia, if present, was rendered entirely manifest. In the slighter cases, glasses of 1 D. would suffice, in the case of emmetropia, for near work. The majority of the cases lay between these extremes.

The degree of the paralysis appeared in general to bear some proportion to the severity of the primary disease, but to this there were many exceptions ; a severe diphtheria leading only to a slight paresis, and a mild throat affection being followed by a complete paralysis.

In no case was mydriasis observed to accompany the loss of accommodation, and in no case was the latter unilateral.

Paralysis of the soft palate was met with in 28 of the 100 cases.

Paralysis of the external muscles of the eye was much less common. Excluding one case of doubtful character, the sixth nerve was affected, on one side or on both, in ten cases. The third nerve was affected in one case only ; the paralysis was bilateral, and the sixth nerves were also affected ; the case was one of severe general post-diphtheritic paralysis, which ended fatally. The necropsy made by Prof. Mendel showed hyperæmia and hæmorrhages in the nerve nuclei, and neuritic changes in the roots of the oculomotor, abducent, vagus, and hyperglossal nerves—changes similar to those found by Déjerine in the anterior roots of the spinal nerves in children in cases of post-diphtheritic paralysis of the extremities. The frequency of sixth-nerve paralysis, in the writer's group of cases, was greater than has usually been met with ; diplopia is easily overlooked in children, and it is probable that a systematic search for it, with the help of a red glass, would bring to light a larger number of cases than are commonly noted.

Ataxic symptoms, with loss of knee-jerk, were noted in four cases : one of these ended in death.

Concomitant convergent strabismus accompanied the loss of accommodation in one case only ; it probably represents the increased effort of convergence, which would naturally accompany an increased effort to accommodate. (Why does it not occur more frequently ?)

Several writers have noted a loss of visual acuteness, together with that of accommodation. Nagel believes the cause of this

to be a slight optic neuritis due to the diphtheritic poison, and appearing as a slight cloudiness of the papilla. Such an appearance is not uncommon, according to Remak, but he thinks that the condition is similar to that which results from uncorrected hypermetropia, and that it is probably caused, in the cases in question, by the increased accommodative effort. (This idea appears to us to be inadmissable. If the accommodative effort were really in excess, as Remak supposes, we should certainly expect to see more cases of convergent strabismus. But this is not all. It is not, we imagine, the excessive *effort* to accommodate which congests the papilla of the hypermetrope, but the excessive *muscular action* which takes place within the eye, and this, of course, is absent when the accommodative apparatus is paralysed.) The lowering of visual acuteness is probably due, in some cases, to the presence of astigmatism, the physiological correction of which, by the lens, is impeded by the weakening of the ciliary muscle.

True optic neuritis was not met with in any one of the 100 cases.

J. B. Emerson (New York). Statistics Illustrating the Etiology of Paralysis of the Ocular Muscles. *New York Med. Journ., May*, 1886, *p.* 520.

The writer tabulates and analyses sixty-four cases of paralysis of the ocular muscles seen by Dr. Roosa and himself during the course of three years.

In 1858 von Graefe made the statement that nearly one half the cases of paresis of the ocular muscles were caused by syphilis. Other authorities place the percentage as high as 65. The third nerve, according to Graefe, is most often affected, next in frequency the sixth, and finally the fourth nerve.

The present enquiry gave results somewhat different.

Third nerve.—There were thirty-six cases of paresis of the third nerve or some of its branches. In ten of these there was a history of syphilitic infection or secondary symptoms. In eighteen there was some known cause other than syphilis. In eight no cause could be found. This gives a percentage of 27·7 with a syphilitic history; or supposing that all the unknown cases were due to syphilis, a percentage of 50.

Of these thirty-six cases, twenty-three were in males and thirteen in females. Of the twenty-three males, nine, of the thirteen females, one, had a specific history. Of the eight cases in which no cause was known, six were in females and two in males.

Sixth nerve.—There were twenty-three cases of paresis of the sixth nerve. Of these, eight had a specific history; in seven, the cause was due to some other known trouble, and in eight there was no known cause. This gives a percentage of 34·3 due to syphilis; or assuming the unknown cases to have been due to syphilis, a percentage of 69.

Of these twenty-three cases, seventeen were in males and six in females. Of the seventeen males, seven had a specific history; in six cases the cause was unknown. Of the six females, one had a specific history, and in two the cause was unknown.

Fourth nerve.—There were only three cases of paresis of the fourth nerve. None of them were syphilitic.

Ophthalmoplegia externa.—There were two cases of ophthalmoplegia externa; in neither was there any specific history.

Paresis of the third nerve was therefore more frequent than paresis of the sixth (thirty-six to twenty-three), but the percentage of syphilitic cases was greater in the latter than in the former (thirty-four to twenty-seven).

Of the whole sixty-four cases. eighteen had a history of syphilis; in twenty-eight there was some other known cause; in eighteen the cause was unknown. This gives a percentage of twenty-eight with specific history; or assuming the unknown cases to have been syphilitic, a percentage of 56.

Of the sixty-four cases, forty-four were in males and twenty in females.

Of the forty-four males, sixteen had a specific history, and in ten cases the cause was unknown. Of the twenty females, two had a specific history, and in eight the cause was unknown.

Of the sixty-four cases, sixty-one were unilateral and three bilateral. Two of the bilateral were cases of ophthalmoplegia externa—one occurring in a boy nineteen years of age, and the other in a man thirty years of age. There was no specific history in either, and, under the "mixed treatment," there was no improvement. The remaining bilateral case was one of

complete paralysis of the sixth nerve, and was in a woman sixty-three years of age, who stated that she had been struck by lightning fifty-eight years before, and that her eyes had turned in ever since.

The total number of cases here tabulated is small for statistical purposes, but it is clear, the writer thinks, that syphilis, as a cause of paralysis of the ocular muscles, has been over-rated. The percentage is here 28. In order to obtain the high percentage given by von Graefe and others it is necessary to assume a connection with syphilis in all those cases in which the cause is unknown, and this is certainly not justifiable.

A point of interest is the relatively small number of cases in women. The case books of the hospital in question showed that about 53 per cent. of the ophthalmic patients were females, but among the cases of ocular paralysis there were forty-four males and only twenty females—more than twice as many males as females. Among the males the percentage attributable to syphilis was 36, whilst among the females it was only 10.

H. Gifford (Omaha). The Direction of the Lymph-streams in the Eye. *Archives of Ophthalmology, June, 1886, p.* 153.

All observers are agreed that the aqueous fluid escapes from the eye at the angle of the anterior chamber. Concerning the escape of fluid from the vitreous there is no unanimity. The majority of observers hold that a current passes forwards through the zonula into the posterior chamber, while this is disputed by Pflueger, Schoeler, and Uhthoff. Stilling and others maintain that a current passes out through the optic nerve. Again, concerning the currents which exist between the sheaths of the optic nerve uncertainty appears at present to prevail. Quincke demonstrated a flow from the brain towards the eye-ball in the subvaginal space, but more recent writers express or imply the opinion that the current flows in the opposite direction.

Gifford has undertaken a long series of experiments in order if possible to settle some of these undecided points.

He injected small quantities of sterilised water containing indian ink or cinnabar in suspension into the vitreous chamber of albino rabbits and in a smaller number of cases he employed cats, dogs, and guinea-pigs. A few of the injections were made with a fine glass pipette which was simply pushed through the sclera in the equatorial region; but seeing that this method was open to the objection that it increased the intraocular pressure, and might therefore modify the direction of the currents, in all the later experiments the pipette was introduced through a small incision in the sclera, which allowed the escape of a drop of vitreous fluid before the injection was made.

In another series of experiments similar injections were made into the cranial cavity. A triangular bit of the scull-cap was removed. the point of the pipette passed through the dura mater, and a couple of drops of the fluid injected; the wound was then closed, sutured, sealed with iodoform-collodion, and covered with several layers of celloidin solution.

Outflow through the Optic Nerve.—Forty experiments were made on rabbits; the results were definite and constant. There was generally little or no reaction. On the second day, or later, according as the injection was made farther backward or forward in the vitreous, the ophthalmoscope showed the particles collecting in the excavation of the papilla. On killing the animal a day or two later, longitudinal sections of the optic nerve showed to the naked eye a pigmented line passing along the centre of the nerve trunk, and leaving it in company with the blood vessels; outside the nerve the pigment could be traced with the naked eye a short distance towards the rear of the orbit. The microscope showed that the granules lay in long lines within the lymph-spaces around the vessels; they appeared to be partly free, and partly enclosed in connective tissue corpuscles, and occasionally in leucocytes. The pigment was found also around the small vessels which radiate from the central artery into the adjacent choroid and into the periphery of the nerve; also for a short distance along the branches which pass backwards into the nerve trunk, especially close to the point where the main vessels emerge from the nerve. No pigment was found in the dural sheath of the nerve or in the subvaginal space.

When the injection was made near to the posterior pole of the eye the pigment was discharged very promptly; when made farther forwards it took longer to reach the papilla. In one case where the indian ink was introduced but a short distance behind the lens, the pigment was first seen at the papilla with the ophthalmoscope on the fifteenth day. Outside the optic nerve the pigment was seen to keep close to the vessels and was sometimes traced to the posterior end of the orbit, where it appeared to enter the cranium through the sphenoidal fissure, though further observations were still required to prove this.

When anthrax bacilli were injected the course taken was the same as in the case of the pigments, except that the bacilli did not enter the finest channels. They multiplied wherever they were carried, and were found in considerable numbers in the orbit and, when the animal lived long enough, in the cranium; from the craninm they passed outwards into the subvaginal spaces of both optic nerves.

Current in the Subvaginal Space.—On this point Gifford confirms the results obtained by Quincke. After injection into the subdural space in the cranium, the pigment was carried into the spinal canal and also in considerable quantities along the subdural and sudarachnoidal spaces to the globes, the greatest quantity in this position being always close to the eyeball; while towards the skull the nerve sheaths were sometimes entirely free from pigment for some distance. From the presence of slight accumulations of pigment at the points where the other cranial nerves passed through the dura-mater, Quincke thought it probable that currents passed out along these nerves also. Gifford found a free passage of fluid from the subvaginal space of the optic nerve into the lymph space around the central vessels at the point where they perforate the nerve sheaths, and thence outwards into the orbits, but little or no current in the opposite direction; thus cinnabar, anthrax bacilli, and blood were seen to be carried down from the cranium to the globe, and then out into the orbit with the central vessels; while, on the other hand, the stream issuing from the vitreous showed no tendency to pass into the subvaginal space.

A passage of blood and anthrax bacilli from the subvaginal space into the eyeball between the choroid and sclera was found to have occurred in a few cases.

Outflow from the Vitreous around the Lens.—The author reserves a full discussion of this subject for a future paper, but states that the experiments which he has already made are sufficient to convince him, "rather against his will," that besides the posterior vitreous stream described above, there is an anterior stream flowing forward around the lens, through what he terms the "perilenticular" space. (Is not *circumlental* better than *perilenticular?* The substantive is *lens*, not *lenticulus*; the adjective should therefore be *lental*, not *lenticular*; just as *mens* gives us *mental*, and *dens*, *dental*. The Latin *circum* is preferable in this combination to the Greek *peri*.—P.S.)

Gifford's experiments supply a valuable corroboration of the view, advanced long ago by Stilling, that there is an escape of lymph from the vitreous in the region of the posterior pole of the eye. It is important, however, to guard against the assumption which might not unnaturally follow that the tension of the eyeball is controlled to an important extent by this posterior vitreous stream, especially as Stilling has suggested that closure of these posterior channels is the cause of a large class of cases of glaucoma. We therefore remind the reader of the experiments of Schoeler (Graefe's Archives, xxv., 4), which showed that the rate at which the intraocular fluid escapes from the eye is not discoverably lessened by occlusion of all possible channels in the region of the posterior pole, while a very marked retardation occurred when the channels which exist in the ciliary region were interfered with. It would appear that the lymph-stream through the papilla is very slow, and of very small amount as compared with the escape of the aqueous at the angle of the anterior chamber.

BERGMEISTER (Vienna). Toxic Amblyopia. *Wiener Klinik*, 3 *Heft*, *March*, 1886.

1.—*Alcoholic Amblyopia.*—Having referred to the observation of amblyopia from abuse of alcohol, in preophthalmoscopic days, Bergmeister proceeds to state that there is an acute and

chronic form of it. Of the acute form he has little to say, but refers to a case—sudden loss of vision after a week's steady consumption of brandy; no ophthalmoscopic changes; complete recovery after energetic antiphlogistic treatment. We much doubt if such a case would be accepted by English observers. In the chronic form, Bergmeister freely admits the difficulty of excluding tobacco from the etiology; and it shows the different views taken of these cases in England and Germany, when he considers it necessary to state that he has observed cases of undoubted tobacco amblyopia. Most English observers have no doubt whatever as to tobacco amblyopia, while probably very few consider alcoholic amblyopia beyond question. Both eyes, he states, are affected in about equal degree usually, objects being seen as through a mist; the patients see better in twilight (day-blindness); they are often troubled with long persistence of coloured after-images. Central vision may fall to $\frac{1}{10}$ or $\frac{1}{20}$; reading vision is specially bad, partly from paresis of accommodation. One of the most constant symptoms is a transversely oval central scotoma for red and green, lying between the fixation point and the blind spot. Ophthalmoscopic examination may give negative results, or there may be a slight hyperæmia of the papilla and veiling of its edges. Later, the temporal half of the disc becomes atrophic, and the visual defect extends from centre to periphery, remaining distinguished, however, from progressive optic atrophy by the absence of the sector-shaped defects in the visual field. Bergmeister emphasises the fact that in these cases of alcoholic amblyopia the light-perception is perfect; that the amblyopia has the character of an optic nerve-lesion; and from the work of Samelsohn, Uhthoff, and others, he concludes that the lesion is a retrobulbar axial neuritis, seated chiefly at the optic foramen, where the macular fibres lie centrally.

2.—*Tobacco Amblyopia.*—The symptoms in these cases, which have been known in England since Mr. Hutchinson drew attention to them, in 1864, are precisely those detailed above, and they are probably due to a similar cause, if the above cases were not really tobacco amblyopia complicated by chronic alcoholism. Bergmeister considers the prognosis favourable in both diseases, complete atrophy and amaurosis being rarely, if ever, produced by either. As to treatment, in

addition to abstinence from alcohol and tobacco, Bergmeister recommends Carlsbad salts, hydropathy, and strychnine injections.

3.—*Lead Amblyopia.*—Bergmeister's views agree substantially with those given in our review of the papers of Stood and Von Schrœder (O. R., Dec., 1885), where also we refer to the above-mentioned work of Samelsohn on retrobulbar neuritis.

4.—*Amblyopia from Carbon Disulphide and Chloride of Sulphur.*—On this Bergmeister adds nothing to the report recently read before the Ophthalmological Society of London.

5.—*Amaurosis from Quinine, from Salicylic Acid, and from Bromide of Potassium.*—Knapp has recorded cases of quinine amaurosis—sudden, complete blindness, with extreme chalk-white pallor of the disc persisting for months, but never, apparently, permanent. The visual field, on recovery, spreads from the fixation point, in an oval of which the long axis lies transversely. The ischæmia never completely recovers. The dose of quinine necessary to produce poisonous symptoms of this character lies apparently between wide limits, from three to eighty grains. Salicylic and potassium bromide amaurosis closely resemble that from quinine. Bergmeister records a case where between three and four hundred grains of salicylate of soda were taken within an hour and a half, with the result of producing complete deafness and blindness, both of which completely passed off.

Bergmeister refers also to disturbances of vision produced by carbolic acid, osmic acid, opium, haschisch, and snake-bite.

Perlia (Aachen). **On acute rheumatic retrobulbar neuritis.** *Klin. Monatsblätter für Augenheilk, April,* 1886, *p.* 132.

After a full reference to the literature of this subject Perlia details the following case:—An engine driver 28 years of age had been treated by Hock for retrobulbar rheumatic neuritis two years previously. In December, 1884, he had a relapse, and in January, 1885, he found that he could not see objects clearly, everything seeming blue, and his eye ached. The left eye was normal. The right was externally also normal, but the

palpebral fissure was narrow and the eye watered. Pressure on the globe caused uneasiness, and all movements of the globe were painful, especially upwards. Ophthalmoscopic result negative. The field of vision showed marked contraction, especially at the upper part. V = $\frac{20}{50}$ colour vision good. The patient was kept in a dark room, and mercurial ointment rubbed into the brow every two hours. Under this treatment pain on movement disappeared, only slight uneasiness remaining on movement upward and inward, in which direction alone there remained a slight contraction of the field. Soon after this the left eye was similarly but more severely affected. The visual field was extremely contracted, a sector-like defect extending to the fixation point in the upper and outer segment, in which direction again the movement was most painful. Green not perceived, red and blue imperfectly. The same treatment resulted in complete cure, the sector defect disappearing very gradually *pari passu* with the pain on movement of the globe upward and outward.

Hock considers that pain on movement of the globe is a point in the differential diagnosis between rheumatic retrobulbar neuritis and optic neuritis from other causes. He believes that the condition present is an acute inflammation of the optic sheath, which is extremely well supplied with sensory nerves, this inflammation extending to the subjacent nerve fibres. He has found also, and in this he is confirmed by Perlia's case related above, that pain on movement of the globe will indicate what part of the sheath is most inflamed, and the position agrees with the greatest defect in the visual field. For example, when movement of the globe inwards produces greatest pain central vision will be much affected, while central vision will in other cases be little if at all effected. This agrees with the anatomical observations of Samelsohn as to the position of the nerve fibres in the optic trunk.

AUGSTEIN (Bromberg). **Disturbance of the Colour Sense in Neuritis.** *Knapp's Archives of Ophthal., Vol. XIV., No.* 4, 1885, *p.* 435.

From the results of numerous examinations Augstein states:—(1) Every neuritis, let it end in atrophy or recovery, is

accompanied by disturbance of the colour sense. In both cases the degree of disturbance may vary from total colour blindness to but slight limitations and irregularities of a single colour. The duration of the disturbance varies in like manner. (2) The examination of the visual fields with pigment colours furnishes the surest data in estimating the course of a neuritis: sometimes it brings to light functional disturbances of the optic nerve when the ophthalmoscopic condition and the acuteness of central vision no longer show any abnormity: it is therefore the most delicate method of examination.

Admitting that there are considerable physiological variations, Augstein states that re-entrant angles even for one colour with normal outer limit, intermingling of the colour limits, destroying their normal succession, and changing concentric curves into zigzag lines, must always be considered as pathological. Apparently insignificant contractions in a certain direction even of one colour only, may justify the conclusion that the function of the conducting fibres is still disturbed. He records examples of various groups of cases in justification of his conclusions, and he shows also the important fact that in accommodative asthenopia, cases in which the discs show a dull red hyperæmia, there is uniform contraction of the fields for all the colours, indicating that disturbance of colour vision may exist before there are any inflammatory, not to speak of degenerative, changes present.

E. Landolt (Paris). The Refraction and Accommodation of the Eye. Translated by C. M. Culver, M.A., M.D., Albany. *Edinburgh: Young J., Pentland*, 1886.

This is beyond question the most important treatise on the optical branch of ophthalmic science which has appeared in the English language since Dr. Moore translated the great work of Prof. Donders more than twenty years ago. Not only the title, but to a large extent the scope, the arrangement, and the admirably clear style of the writing remind us of the latter. In amount of new and original matter no second book can vie with that of Donders, but Landolt presents so well not only his own researches but all the scientific advances and improved

methods which have been elaborated of late years that his treatise will be welcomed by all ophthalmologists as a standard work of the highest order.

Dr. Culver has rendered the book into excellent English. There are naturally some phrases which tell that it was translated in America and not in England, but there are none of those too literal transcripts of foreign idioms which mar a good deal of the ophthalmology which appears in so-called English.

The work consists of three chief portions—a physical, a theoretical, and a clinical. The physical portion is a treatise on optics, which is intended to enable the reader to dispense with other books on physics, so far as concerns the essential problems in ocular optics. Well knowing that mathematical formulæ, though simplified as far as the subject will permit, are a stumbling block to many practitioners, the author has separated the mathematics from the rest of the work, and the perusal of this section may, he tells us, be entirely omitted. The reader may begin with the second chapter, in and after which, he is promised, he shall find no formulæ. This promise, although not strictly fulfilled, is a great encouragement.

The second chapter deals firstly with the static refraction of the eye—the curvatures, relative positions, indices of refraction, and combined dioptric properties of the media. The average dimensions of the dioptric system are given according to the most recent conclusions of Helmholtz, and we see that the average thickness of the lens is stated to be 3·6 millimetres. We do not know by what means this measurement was arrived at, but we venture to say that it is far from being correct, and that the schematic diagram in which it is adopted misrepresents the contour of the lens to an extent which will be manifest to anyone who compares it with a series of real lenses examined with due precautions. Judging from many measurements we should say that during static refraction the lens of the young adult has a thickness of at least 4·5 mm., and in later life a greater thickness still.

Having discussed the angles alpha and gamma, and the relations of the dioptric system in emmetropia and ametropia, the author proceeds to the dynamic refraction of the eye—the accommodation. Here we find among other illustrations Iwanoff's excellent drawings, coloured to show the form of the

ciliary muscle in E, M, and H ; and a summary of all the experiments and observations by which the accommodation changes in the lens, the manner of their production, and the varying relations of the parts concerned have been determined. It is hardly necessary to say that the whole of the accumulated evidence confirms the theory of Helmholtz.

The chapter concludes with forty pages on a subject which the author has made peculiarly his own, namely, the amplitudes of accommodation and convergence, and the mutual relation of these two functions. The reader will find an original paper on this subject by Dr. Landolt in our present number.

We may point out that in discussing the influence of age upon refraction and accommodation it is no longer sufficient to refer to changes in the indices of refraction ; the increased volume of the lens must in the absence of compensatory changes modify its refraction, and this has not yet been taken into account.

Chapter III. describes the several methods by which the refraction and accommodation of the eye may be determined ; all the principles of optometry are explained, but the author, writing for the purposes of practice, refrains from burdening his pages with details of all the different kinds of optometers. He enumerates the following methods :—

Static Refraction. Subjective Methods.—(A) Method based upon the acuteness of vision. This is the use of the ordinary test types and trial lenses. Landolt proposes also a method in which types proportionally reduced in size may be placed at a much shorter distance from the eye than is usually employed, a lens of corresponding focal length being placed at the anterior focus of the eye, *i.e.*, 13 mm. in front of the cornea. The tendency to accommodate created by the nearness of the object is overcome by the use of a stereoscope, which requires parallelism of the visual lines, as used by Javal in his astigmometer. The reduced types, surrounded by a circle, are placed at the bottom of the stereoscope opposite the eye to be examined ; before the other eye is a black field also surrounded by a circle. In order to unite the two circles the eyes must have a parallel direction and this relaxes the accommodation. A convex lens corresponding to the distance of the types being

placed before the eye, the emmetrope sees the types distinctly; the addition of convex or concave lenses will reveal the presence of H or M as in the ordinary method. (B) Optometers based upon a single convex lens. (C) Optometers based upon Galileo's telescope. (D) Optometers based upon the astronomical telescope. (E) Optometers based upon the measurement of circles of diffusion. This last group includes several instruments based upon Scheiner's experiments—the doubling or multiplication of an object not in focus when viewed through one or more small holes. (F) Optometry based upon the chromatic aberration of the eye.

Static Refraction. Objective Methods.—(A) By the erect image. (B) By the inverted image. (C) By pupilloscopy or koroscopy. These two names are synonymous with retinoscopy, keratoscopy, and the shadow test. Of this method the author gives a clear description, but we do not gather that he himself attaches a great practical value to it, as we do in this country. Thus he says that by its means Parent "succeeds in determining the degree of the ametropia;" and again, speaking of astigmatism, he says that one does well to have recourse to the shadow test when in doubt as to whether there be astigmatism or not, and that in this way "one may succeed even in ascertaining the direction of the principal meridians." We venture to prophecy that Dr. Landolt will some day pay a higher tribute to it than this.

In Chapter IV., which treats of astigmatism, the author reverts to a subject on which he has previously published observations of much interest, viz., the relations which exist between malformations of the cranium and malformations of the eye. In describing the methods of dealing with the defect, he says, "We very seldom have recourse to atropisation for the determination of astigmatism"; a statement which, coming from an authority so high, should do something to moderate the use of the drug in the hands of some over-zealous refractionists.

Chapter V. constitutes the clinical portion of the work, and it is to this that the practitioner will refer most frequently and with the greatest advantage. We cannot attempt to abstract even its most important features. Suffice it to say, what those who know the author will anticipate, that all details of the

subject are expounded in a manner at once scientific, practical, and clear. It opens with a general view of refractive errors, which strikes us as particularly good :—

It is logical, correct, and practical, to classify the refractive conditions of the eye as hyperopia, emmetropia, and myopia; emmetropia representing the average normal refraction, ametropia the refraction which deviates from this standard—hyperopia below, myopia above. But from a clinical point of view it is wrong to consider emmetropia as the only physiological condition of the eye, having a pathological type on either side. It must not be supposed that every eye, the principal focus of which does not fall on the retina, ought to cause anxiety and demand optical correction or even medical care. In opposition to a too prevalent tendency to polytherapy which he has remarked, Landolt insists that a *slight* degree of H or M does not of itself render an eye pathological.

Next to this slight degree of ametropia comes the *medium* degree—about 2 to 4 D for H. and 3 to 6 D for M. Here the conditions are very different; the ametropia nearly always calls for optical correction; the eye may still be healthy, and its acuteness of vision and range of accommodation equal to the emmetropic standard, but differences in the form and size of the globe begin to show themselves, and find expression in the field of fixation, showing greater excursions for the hyperopic, smaller excursions for the myopic eye. The peculiar characteristic of the medium degrees lies, however, in the fact that although each eye alone may still work normally, the co-operation of the two is impaired: the degree of convergence required by the position of the object does not agree with the degree of accommodation which corresponds to the ametropia; hence the inconveniences, torments, and dangers to which eyes of a medium degree are exposed when binocular vision is maintained.

Next come the *high* degrees of ametropia. Such eyes may generally be regarded as pathological, the hyperopic as imperfectly developed, the myopic as actually diseased. Both kinds work badly. Visual acuteness is below the normal standard, accommodation is almost always defective, the motor apparatus is damaged, often very considerably.

If, in the first category of ametropia, we should guard against a too zealous intervention, with regard to medicaments as well as glasses; in the second, an acquaintance with ocular physiology and attentive observation achieve their greatest victories; while the last class constitutes a vast field open for optical correction, as well as for therapeutic action, especially in malignant myopia.

The volume is a handsome one and is admirably illustrated throughout.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

FRIDAY, JULY 2ND, 1886.

JONATHAN HUTCHINSON, F.R.S., President, in the Chair.

Reported by DAWSON WILLIAMS, M.D.

Monocular Iritis.—Dr. W. A. Brailey showed drawings from a case of monocular iritis in a child. The iris was discoloured, and projecting from it were several small greyish-white or pinkish-white nodules; it was adherent at three points to the lens. In the corneal substance were several small greyish opacities. He was himself of opinion that the disease was tubercular, though the aspect of the patient had suggested congenital syphilis to Mr. Hutchinson.—The President thought that this was a case in which it would be most interesting if the later history could be traced. The enlargement of glands which was present was a point in favour of the diagnosis of tubercular disease.

Interstitial Keratitis.—Dr. Brailey also showed a case of interstitial keratitis; he suggested that the changes in the left cornea were tubercular; in the right cornea the changes were clearly of a syphilitic type. The left eye showed about a dozen small greyish-white fairly-defined nodules.

Pulsating Tumour of Orbit.—Mr. A. Q. Silcock showed a patient who presented a large pulsating tumour of the orbit. The sight of both eyes had been destroyed by a charge of small shot some years earlier. Within two or three days after the accident he heard a hissing noise in his head. A tumour, occupying the inner angle of the left orbit, and extending over

the bridge of the nose, began to develop about twelve months after; pressure on the left carotid, which was enlarged, arrested the pulsation and *bruit* in the tumour. The tumour was not gaining rapidly in size. Mr. Silcock said that he had brought the case for advice as to treatment; he was inclined to undertake ligature of the carotid, as any accidental wound of the tumour might be followed by fatal hæmorrhage. Mr. Hulke had advised resort to electrolysis.

Mr. Adams Frost said that the case reminded him of one which he brought before the Society in 1882 (Oph. Soc. Trans., III., p. 9). In that case there had been an accident in childhood, accompanied by symptoms of fracture of the base of the skull. The pulsating tumour had appeared first in one orbit and then in the other, and there could be no doubt that it was due to an arterio-venous communication within the cranium. He believed that in the case shown the lesion was of this nature. The fact that the tumour had not appeared until a year after the accident, although the noise in the head had been audible to the patient from the commencement, was more consistent with this view than with that of an intraorbital lesion; and the evidence of recorded cases tended to show that aneurysmal varix of the cavernous sinus was almost always the primary lesion. As regards treatment, the extreme chronicity of these cases had to be borne in mind. The case he had mentioned had become no worse during the last four years, although the patient was employed in hard manual labour. There had been occasional exacerbations of pain and pulsation. but these had subsided with rest and digitalis. Even if the disease were entirely intra-orbital, electrolysis would surely be extremely dangerous; if there was any possibility of the tumor being of intracranial origin, it could not, of course, be entertained.

The President thought the case was an example of arterio-venous communication within the orbit. As the patient suffered little inconvenience, he was not inclined to advise any radical treatment; but if it were necessary to treat the condition, he would rather ligature the carotid than make injections or use electrolysis. As illustrating the comparatively slight inconvenience which tumours of this nature might cause, he mentioned the case of a woman who had been under his

care on account of a large circoid aneurysm of the scalp. He had ligatured the occipital and temporal arteries; but the growth did not materially diminish, and the woman left the hospital in a condition which differed little, if at all, from that in which she was when admitted. He had recently seen this patient again, after an interval of twenty years, and he had found that the tumour had not materially altered, nor seriously interfered with her comfort; she had married and was the mother of a large family.

Double Chronic Glaucoma.—Dr. W. A. Brailey described a case of chronic glaucoma affecting both eyes of a man aged sixty. The man died of aortic aneurysm, which had existed for twelve years; vision had been failing for three years, but was never insufficient for ordinary purposes; tension in both eyes was increased (T + 1). No operation was performed. Microscopical examination after death showed cupping of the disc, inflammation of the optic nerve extending, in decreasing degree, through the chiasma to the optic tract. The iris was neither inflamed nor atrophied. The muscular elements of the ciliary body were inflamed. This case appeared to show that the inflammation and atrophy of the iris, so commonly found in glaucoma, were entirely secondary to the establishment of the tension; the same remark applied to the inflammation and atrophy of the ciliary body.

Corneal Changes in (?) Acquired Syphilis.—Dr. M. J. Symons (Adelaide, South Australia).—The patient, a man, aged 29, who had acquired syphilis eight years earlier, first noticed that his eyes were weak, and that there was a white film on them, seven weeks before he came under treatment. At the latter date, there was thinning, bulging, and opacity of both corneæ, without any disturbance of the epithelium or vascularity. The opacities occupied crescent-shaped areas in the upper and inner quadrant, being separated from the sclero-corneal junction by a narrow rim of clear cornea. T. normal. There was no disease of media or fundus. V: R $\frac{20}{50}$ and J 1; L $\frac{20}{200}$ and J 2. The iris was adherent to the opaque area in each eye. The other tissues of the eye appeared to be healthy. Slight improvement was noted after treatment with iodide of potassium for a fortnight, but the patient then left the hospital.

The President said that the case was an example of corneal changes occurring in the tertiary period, but he felt no certainty that they were directly connected with acquired syphilis. He asked whether any member had ever seen corneal changes from this disease.

Mr. Nettleship had seen a few cases of keratitis in acquired syphilis. A woman was now under his care with diffuse keratitis, closely resembling the keratitis of inherited syphilis; in another case, in a young woman, he had seen a similar keratitis in one eye.

Mr. McHardy could recall a couple of cases strictly analogous to Mr. Nettleship's cases; in both, he had examined other members of the family without discovering any evidence of inherited syphilis.

Mr. Lang had seen one patient, a married woman, aged 36, with typical interstitial keratitis, suffering from acquired syphilis; in this case. there was no evidence of congenital syphilis. He referred to a second case, in a man, of interstitial keratitis, which occurred twelve years after infection.

Dr. A. Money was led to ask what was the latest age at which genuine interstitial keratitis of congenital syphilitic origin could occur, by having recently seen a case in a woman, aged 33, in whom the inherited syphilis was unquestionable.

Mr. Hutchinson said he had seen several cases as late as 36 years of age.

Mr. Nettleship referred to cases between 30 and 40 years of age.

Mr. Adams Frost mentioned a case in a woman 39 years of age.

Nævus involving Eye.—Mr. Simeon Snell (Sheffield) sent a description of the case of a woman, aged 17, in whom a cutaneous nævus extended over the brow on the right side from the orbit for four inches, and involved also the upper eyelid. Vision in the right eye had always been imperfect, if not absent. The tension of the globe was increased ($+ T_2$), and there was some pain, which was relieved by eserine. No reflex was obtainable from the fundus; the posterior part of the vitreous was occupied by a greyish flocculent substance; the pupil was dilated; at the inner and lower ciliary region was a staphyloma, and the surface was vascular, with deep

tortuous vessels. In the circum-corneal region above was a purplish area, which extended upwards and backwards, and apparently involved the sclerotic. The eye was enucleated.

Dr. W. A. Brailey had examined the eye after removal. The retina was detached, the optic disc hidden by a great thickening of the choroid ; the muscular substance of the ciliary body was shrunken ; the iris was inflamed and atrophied. The thickening of the choroid was due to the presence of numerous vascular channels.

Paralysis of External Recti.—A paper by Mr. W. J. Cant, Lincoln, on the case of a man, aged 63, suffering from double vision, headache, and complete paralysis of external recti muscles, with slight optic neuritis. The urine was slightly albuminous. Under saline purgatives and iodide of potassium the recti muscles gained power, and double vision became less marked.

Dr. Seymour Sharkey supposed that it was meant to be inferred that the paralysis was connected with Bright's disease ; the evidence, however, of the presence of that disease was slight ; the ophthalmoscopic changes were not those of albuminuric retinitis, but of optic neuritis. On the whole, he was inclined to suggest that there might be an intra-cranial tumour.

The President suggested that the case was an example of ophthalmoplegia externa in an early stage.

Dr. A. Money suggested that the paralysis might be due to diphtheria, which would account for the albuminuria.

Card Cases. — Mr. W. H. Jessop: Drawing of a case of Leukæmic Retinitis (under the care of Dr. Andrews, in St. Bartholomew's Hospital). — Mr. Marcus Gunn : Peculiar Congenital Deep Partial Excavation of the Optic Disc.— Mr. W. J. Cant (Lincoln): Drawings of Symmetrical Disease, probably Congenital, of the fundus, in a child.

Annual Business.—The annual report of the Council and the financial statement was read by Dr. Sharkey, Honorary Secretary. It congratulated the Society on its continued and increasing success.

A motion by Mr. Cowell, with reference to the duration of offices, was referred to the Council.

The list of Officers and Council, submitted by the Council for election, was adopted.

Address of Retiring President.—Mr. Jonathan Hutchinson, in a short valedictory address, after congratulating the Society on having secured Mr. Hulke as its third president, and referring to the serious illness from which the first President, Sir William Bowman, is now recovering, reviewed the work of the Society during the three years for which he had held the office of President. He considered that the result of the experiment of collecting facts concerning Graves' disease, which had been made during the session was of good augury for the success of future undertakings of a similar nature; this was a sphere in which the Society would find a special field for thoroughly valuable work. He mentioned as instances of the topics suitable for such work, certain questions regarding tobacco-amblyopia. He believed that this form of amblyopia never relapsed; but half an hour's debate, after the attention of the members had been directed to the question for a year or so, should be sufficient to settle the question. There were grounds for believing that many cases of tobacco-amblyopia got well, even though smoking was not given up, and it would be most valuable to learn whether neglected cases ever progress to absolute blindness. With regard to amblyopia potatorum, the doubt existed whether it was due to the spirits imbibed, or, as some hold, to renal disease or to tobacco, for many spirit-drinkers were also large smokers. Another suggestion he had to make was that it would greatly increase the useful work of the Society if further particulars and the sequel of cases inserted in the Transactions could be sought for and recorded in a supplement of the Transactions. The Society, he felt, ought to increase its value to general medicine by ascertaining what ocular lesions indicate disease in other parts of the body. Systematic effort to organise the work of the Society was needed; he suggested that a Special Committee should be appointed for the purpose.

A vote of thanks was unanimously adopted.

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SPECIFIC FEVERS AND DISEASES OF THE EYE.

By J. Hutchinson, Jun., F.R.C.S. Eng.,

Ophthalmic Surgeon to the Great Northern Central Hospital, and Surgical Registrar to the London Hospital.

Using the former term broadly, and including, for instance, diphtheria and pyæmia as well as smallpox and measles, it cannot be doubted that our belief in their influence in the production of various diseases of the eye has of late considerably increased, and it is probable that it will further extend, and that we may possibly trace to them some intraocular changes, the cause of which is hitherto obscure—some cases of choroiditis for example.

Even enteric fever has been shown to have its share in this direction. Nothnagel, my father, Dr. C. Allbutt, and others have recorded cases of optic neuritis and atrophy following typhoid. In some there were signs of meningitis, in others not. Dr. Allbutt ("The Ophthalmoscope," p. 325) mentions six cases under his observation, and briefly quotes one.

James O'B., æt. 7, had enteric fever severely, and during the fourth week of the attack various complications pointing to meningitis appeared—headache, vomiting, photophobia, and external strabismus. On the eyes being examined six months later, it was found that both discs were atrophied, the strabismus had persisted, and there was also ptosis of each upper lid.

The same complication (optic neuritis and atrophy) has been recorded after nearly all the specific fevers, *e.g.*, after measles (V. Graefe, Nagel, Wadsworth), scarlet fever (Allbutt, Gowers), variola (Leber), diphtheria

(Bouchut). In fact, it is interesting to note that, with the exception of diphtheric cycloplegia, not one of them can be said to possess a peculiar and characteristic ocular lesion. Thus scarlatina, measles, and smallpox are each liable to be followed by troublesome corneal ulceration, and the form of pan-ophthalmitis leading to "pseudo-glioma" may apparently result from any of the specific fevers (Nettleship, "Ophthalmological Transactions," Vol. III., p. 57). And this is only what one would expect from the close resemblances which some cases of the different fevers present to each other. How frequently do ambiguous cases puzzle the practitioner for a name, and how often apparently hybrid forms occur.

Especially with regard to pyæmia has our knowledge of ocular changes been added to of late years. In "Dr. Gowers' Medical Ophthalmoscopy," a resumé of the observations of Litten, Roth, Heiberg, and Virchow is given. Plugging of retinal or choroidal vessels leading to septic retinitis and choroiditis appears to be the essential lesion. In 1868 Dr. Hughlings Jackson recorded the occurrence of optic neuritis in pyæmia (see "Med. Times and Gazette" for June). According to Gowers, these ocular changes "occur only in intense forms of septicæmia, commonly not long before death." Recovery, however, in the most severe cases of pyæmia does undoubtedly occasionally result; and it is in these instances especially that a thorough examination of the eyes would be of great value and interest. Dr. Barlow, Mr. Nettleship, and my father have each recorded cases of pseudo-glioma in patients who had recovered from what was apparently pyæmia.

In the following case, recently observed at Moorfields, I cannot help suspecting a causal relation between an attack of pyæmia and subsequent iritis:—

Geo. R., a carpenter, then aged 16, sustained in the autumn of 1883 a wound of the left wrist, which suppurated. He was subsequently extremely ill; according to the account of his medical attendant he was delirious, had rigors, effusion into

many joints, and from the right knee a large amount of purulent fluid was twice aspirated. He recovered very slowly, and was not well until May, 1884. Of the pyæmic nature of this attack there can be little doubt, and his medical man was quite convinced of it. The patient had never had any rheumatic symptoms, had always lived in the country, and denied having had either gonorrhœa or syphilis. When he attended in January, 1886, he was in robust health, except as regards his eyes. In both there were many old posterior synechiæ, the iris, except the pupillary margin, appearing normal. Vision = about $\frac{20}{70}$ in each. There was not, nor had there ever been, any pain in the eyes. The discs were normal, and there was no sign of choroiditis. The attack of iritis had either occurred during his illness, or had come on gradually shortly after it, but the former was the more probable.

There was not the slightest evidence of either acquired or inherited syphilis about the patient.

Nettleship ("Diseases of the Eye," p. 362) mentions the occurrence of uncomplicated iritis after smallpox, and one would expect it to be occasionally met with as a sequence of the other specific fevers. The dangers of keratitis after variola have long been known, but De Wecker ("Traité Complet.," T. II., p. 154) states that this complication has, since vaccination was introduced, become much rarer. Hebra observed it only in about one per cent. of some 12,000 cases of smallpox during an outbreak in Vienna. I believe only a small number came to Moorfields after the epidemic in London in 1884, and certainly the few that I observed fully bore out the advantages of vaccination, for in the majority it proved that for some reason no vaccination had ever been performed.

In the following case it seemed possible that an attack of variola had caused the onset of cataract, though of course it might only be a coincidence.

Laura F., æt. 37, in June, 1885, had severe smallpox, and was left considerably pitted. Before then she was certain that her sight was perfect; since the attack she had suffered from

pain in both eyes, with dimness of vision. She read $\frac{20}{40}$ and 1 J from 6″—9″. Under atropine, the refraction was found to be emmetropic, there was slight general haze of each lens, and in addition, triangular peripheral opacities, the apices pointing to the centre of the lens. Fundi normal. The urine contained neither sugar nor albumen.

In young adults especially, one meets with similar cortical opacities, for which no cause can be assigned, but in this case the patient was most positive in assigning the defect of vision to the attack of smallpox.

In investigating the relation between ocular changes and specific fevers, one must remember that a supposed attack of one of the latter may have really been secondary syphilis, and in the following case I think there is no doubt this was the case.

Jane D., æt. 28, came to Moorfields for optic neuritis of the left eye in October, 1885. She married at the age of nineteen; her first two children were born at full time, and are now in good health. Between the second and third confinements she had an illness which she called smallpox; she did not, however, go to any hospital, nor was she in bed more than a few days. About that time her hair thinned greatly, but no evidence of other suspicious symptoms could be obtained. Her next three confinements ended in miscarriages, and she has had none since.

On admission, the right eye presented nothing abnormal, vision (with $-$ 1 D) = $\frac{20}{20}$.

With the left she could only count fingers; colour-vision was completely lost; the field for large white objects was apparently good. There was acute optic neuritis; no perivascular white lines; the urine was normal. With the exception of occasional headache and "bilious attacks," she had lately been in very fair health.

Under a mixed iodide and mercurial treatment the vision improved steadily during the next few months, and in February, 1886, she read $\frac{20}{30}$. This, however, subsequently deteriorated to $\frac{20}{40}$, and slight atrophy of the papilla resulted.

Cases of secondary syphilis, it is well known, have occasionally deceived the most competent observers,

closely simulating variola, typhus, or other of the specific fevers. And this seems a further reason for expecting intraocular changes to occasionally occur after the latter, as they do so commonly in the course of the former disease.

A FAMILY OF FOUR CHILDREN AFFECTED WITH RETINITIS PIGMENTOSA, THE FATHER BEING AN EPILEPTIC.

W. J. CANT, LINCOLN.

The special interest of this group of cases lies in the fact that the usual etiological relations of the disease are absent. There has been no consanguineous marriage, and there is no history of the disease in the family. The only possible cause that can be found is epilepsy in the father; he has as many as two or three fits a day, but occasionally has none for two or three days.

The family consists of four children, and all are affected, the disease gradually increasing from the youngest, aged 5 years, whose fundus oculi is dotted with minute dots of pigment at the periphery, to the eldest, aged 15 years, in whom the pigment is seen in much larger quantity, and extends nearly to the centre of the retina.

The blood vessels, especially in the elder children, are small and the discs whitish.

They are all hypermetropic from $\frac{1}{40}$ to $\frac{1}{12}$, the two eldest boys having right internal strabismus. Vision varies, in the eldest being $\frac{5}{50}$ and J 6, while in the younger ones $\frac{5}{18}$ and J 4 can be reached.

The field of vision is greatly diminished in all; in the left eye of the eldest it is as follows:—

$$\begin{array}{ccc} & 25 & \\ 25 & \text{L} & 25. \\ & 20 & \end{array}$$

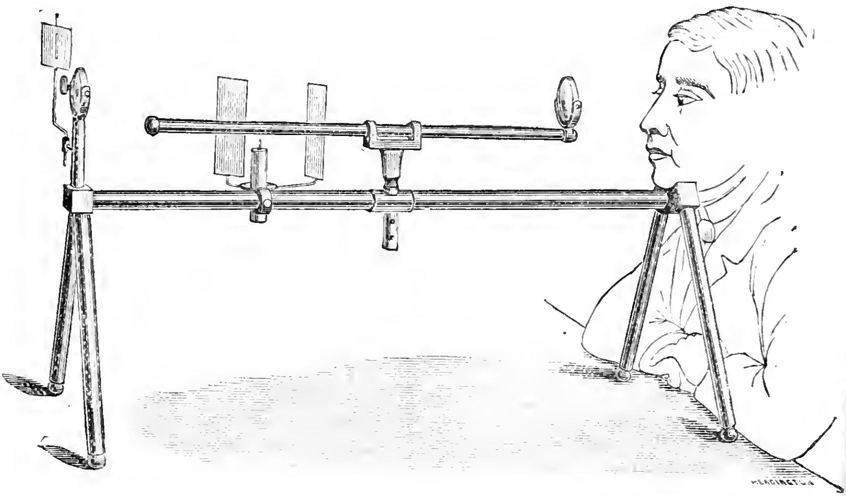
They all have difficulty in finding their way about towards evening, and see very badly in artificial light. The colour sense is normal.

They have taken iron and strychnine internally, and the continuous current from a six-celled Leclanché battery has been applied through the temples during six months, with signs of slight improvement.

A NEW DEMONSTRATING OPHTHALMOSCOPE.

By Priestley Smith.

At the request of Messrs. Pickard and Curry I made for them some months ago a somewhat rough design for a new form of demonstrating ophthalmoscope. Several modifications and improvements in construction having been effected after trial, the instrument is now completed, and will be found, I think, to work easily and well, and to answer the purposes for which such instruments are designed.



The general arrangement of the instrument is explained by the accompanying woodcut. At one end of the horizontal bar is a chin-support for the patient; at the other a perforated glass mirror, capable of steady

adjustment to any position. The transverse arm near to the mirror carries a candle, provided with a light metal screen on either side of it; one of these hides the candle from the patient, the other hides it from the observer, and enables him at any moment to cut off the light from the mirror, and thus to protect the patient's eye from unnecessary illumination without disturbing the adjustment of the instrument. A wire placed in the pillar of the mirror and moveable to either side, carries a piece of white paper, which serves as a fixation point for the patient's eye. At the middle point of the horizontal bar is a jointed support carrying a light rod, one end of which is held in the hand of the observer, while the other holds the lens. By means of this rod the observer can place the lens in any desired position in relation to the patient's eye.

Directions for Use.

1. Put the instrument together according to the drawing.

2. Adjust the patient's seat so as to bring his chin comfortably on the support; let him rest his arms upon the table.

3. Place the rod quite horizontal, and then raise or lower the central support until the centre of the lens is on a level with the patient's pupil.

4. Push the lens to one side and adjust the mirror so as to throw the light upon the patient's eye, telling him to look, *not at the mirror*, but at the paper placed upon the wire. The paper must be on the opposite side to the eye.

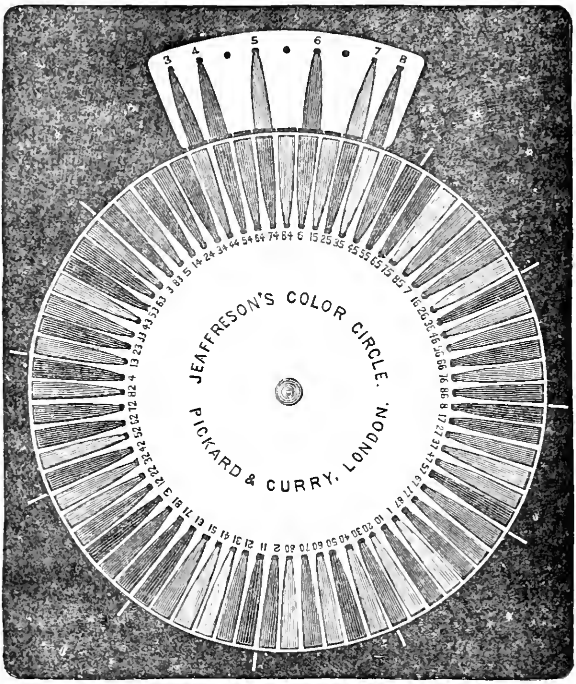
5. Take the rod in the hand and adjust the position of the lens so as to bring the optic disc into view.

6. In changing places with another observer, cut off the light from the mirror by means of the candle-screen.

C. S. Jeaffreson (Newcastle). A Colour Circle for Testing the Chromatic Sense. *Lancet, July 17th, 1886, page* 115.

This instrument is founded on the principle of Holmgren, and is designed to facilitate the rapid and easy application of the wool tests and the systematic recording of results.

It consists of a test board and a revolving colour disc. The disc consists of a white enamel tin plate twenty-two inches in diameter. Its margin is cut out or notched so as to form



passes through an aperature which is situated opposite the altogether seventy-two bobbins or winders to hold the skeins of different colours. The wool, when placed upon these winders, centre of each notch; it thus assumes the form of a cone, the

apex of which is directed towards the centre of the circle, the base occupying the extreme margin, as in the annexed sketch, where the shaded cones represent the colours. The test board, which is immovable, consists of a segment of a circle the concavity of which fits the convexity of the disc, and which carries a series of test colours. The disc rotates upon its centre, and by means of a weak catch stops when the bases of the cones are exactly opposite those upon the test board. The test colours are those of the spectrum—red, orange (yellow), green, blue, and violet ; purple has been added so that the test may be applied on Holmgren's principle. Upon the disc there are seventy-two colours. No two of the same hue stand side by side ; they appear to be scattered around the whole circle ; they are in reality grouped and numbered on a definite system.

In using the instrument a test colour is shown to the patient, and he is directed to look at it carefully, and then gradually and slowly to turn the wheel until a colour which to his eye corresponds, although of a lighter or darker shade, comes immediately above it, and completes the figure which is formed by the junction of the two cones at their bases. When he is convinced of the correspondence, *he is to remove his hand completely from the wheel*, and the examiner then notes the number of the colour chosen.

In recording the results, the observer writes down the number of the test colour as a numerator, and beneath it the numbers of the colours chosen as denominators. The numbering of the series is such that if the selected colours be correct, their numbers will bear a certain correspondence to the number of the test-colour. Thus the test-colour green is number 3, while the shades of green upon the disc are 30, 31, 32, 33, and soforth. A glance at the recorded figures shows at once whether or not there is any discrepancy, and where errors have been made the nature of the defect may be studied at any time from the recorded figures. The instrument is made by Messrs. Pickard and Curry, of Great Portland Street, London.

AMERICAN OPHTHALMOLOGICAL SOCIETY.

TWENTY-SECOND ANNUAL SESSION, HELD AT NEW LONDON, CONN., JULY 21ST AND 22ND, 1886.

President, DR WILLIAM F. NORRIS, OF PHILADELPHIA.

Reported by DR. EDWARD JACKSON.

Dr. H. Knapp (New York) briefly called attention to the *pyogenic bacteria.* Pure cultures of them had rendered possible important experiments. Such cultures of pyogenic and non-pyogenic forms were exhibited in culture tubes and beneath the microscope. Two rabbits were shown which had the previous day been subjected to double cataract extraction. In the left eye of each the operation had been done aseptically, in the right the wound had been inoculated with a pure culture of staphylococcus pyogenicus. The left had in addition been subjected to deep probing and gouging. When shown, the left exhibited extensive hemorrhage in the vitreous; plastic inflammation: cornea clear; normal healing; very little discharge. The right showed abundant purulent discharge; cornea gray; no tendency to union of the wound; purulent panophthalmitis. Two more rabbits were then subjected to similar operations. The left eye of each being opened with a knife that had been washed and heated in the flame of an alcohol lamp the lens was pressed out and some vitreous followed. A needle similarly treated was now thrust into the eye and moved about, causing disorganisation of the vitreous and extensive hemorrhage. The right eye was opened with a knife dipped in an infusion of a pure culture of the *staphylococcus*; the lens expelled and the edges of the wound inoculated by a needle dipped in the same infusion. Dr. Knapp offered to supply pure cultures of pyogenic bacteria to any who wished to experiment on the subject.

Dr. G. Strawbridge (Philadelphia) asked if such experiments threw light on the best methods of cleaning instruments.

Dr. Knapp: Smooth, perfectly polished instruments are bacteriologically clean when washed in clean water and wiped with a clean towel. Unpolished instruments are very difficult to clean in this way. All effective antiseptic solutions blunt the edges of cutting instruments placed in them. Other

instruments may be cleaned in that way, but knives and cystotomes should be kept perfectly bright and washed and carefully rubbed. He thought this would become the general practice, supported as it was by exact experiment.

Dr. B. E. Fryer (Kansas City) thought hydronaphthol would not injure the cutting edge of an instrument, if it proved a reliable antiseptic; also that chloroform would sterilise.

Dr. H. D. Noyes (New York) asked if alcohol affected the cutting edge of an instrument.

Drs. Knapp and C. R. Agnew (New York) thought it did.

Dr. Hubbell (Buffalo) said Dr. Knapp's experiments referred to the condition of the instruments; had he made any as to the susceptibility of the eye as a determining cause of such inflammations? He had done a cataract extraction where the wound was bathed with a chronic purulent lachrymal discharge, and both the preliminary iridectomy and the extraction had been followed by healing without complications, a saturated solution of boracic acid being the only antiseptic used.

Dr. Knapp: Such cases are dangerous. If compelled to operate under such circumstances would not use cocaine, because it checks the pouring out of blood and lymph that tends to wash away any septic matter. But infection does not always follow inoculation Where such a purulent discharge is present it should be examined not only by the microscope, but by culture methods and the inoculation of pure cultures obtained.

Dr. J. A. Andrews (New York): Pricking of the cornea by an infected needle does not always cause suppuration. To wipe instruments on a towel handled by the nurses of a general hospital would be dangerous, but absorbent cotton might answer well. He used as an antiseptic fluid, for cleansing instruments, &c., boiled water.

Dr. Knapp did not use towels but freshly washed linen rags to wipe instruments on.

Dr. J. Green (St. Louis): What degree of heat will sterilise an instrument?

Dr. Knapp: 150° Cent.; but even if attained in a special steriliser, it injures the instrument.

Exudative Retinitis occurring in the course of Bright's Disease. —Dr. C. S. Bull (New York) presented an analysis of 103 cases examined by himself, and which he had been able to follow to the end. or to the present time. Cases in which the albuminuria followed scarlatina or pregnancy had been excluded. The condition of the urine and action of the heart had always been carefully examined. At the time of first visit the visual trouble had lasted from three days to years. Previous duration of the kidney disease uncertain, but in most cases probably considerable. The age of the patients ranged from 5 to 78 years. Visual acuteness ranged from $\frac{20}{XX}$ to zero. In sixty-nine cases there was hemorrhage. No case was seen in the first stage as described by Leber. In the second stage there was in a few cases a pure papillitis, but some retinal exudation always occurred later. Retinal exudation seemed to occur independently of hemorrhages. Vascular changes, though very constant in other organs, are by no means always seen in the retina. Hemorrhage seemed to depend on vascular changes. In three cases hemorrhage caused large scotomata. In one case there was erythropsia.

In Leber's third stage no sign of absorbtion of the retinal exudation in the region of the macula was noticed; even though the improvement in vision was well marked. In unfavourable cases post inflammatory atrophy of the optic nerve occurs.

Of the 103 patients, eighty-six have died. In the first year after coming under observation fifty-seven died. In the second, eighteen: in the third, six; in the fourth, four; and in the sixth year, one. Of the seventeen still living, fourteen had been seen within the last six months. In one case seen seven years ago, the renal disease is still present. In four cases sugar was at some time present in the urine in variable quantities.

The President agreed that it was certainly very rare for the retinal exudation to be entirely absorbed in such cases.

Dr. W. H. Carmalt (New Haven): Does the presence or absence of hemorrhage aid in the prognosis of the time of death? Dr. Bull: No.

Dr. E. Gruening (New York) had seen in hospital practice several cases of complete blindness, the whole retina being occupied by exudation, such as is usually seen in the region of

the macula only. He thought albuminuric disease of the retina arising in connection with large white kidney was frequently seen in the hospitals, where such patients would be encountered rather than in office practice. He had inquired as to the fate of 100 patients after an interval of two years, and learned that all were dead. He had seen the appearances commonly regarded as typical of Bright's disease confined to one eye in a person free from kidney disease.

Dr. Wm. S. Little (Philadelphia): Does cessation of the retinal disease make the prognosis favourable? Dr. Bull: No.

Dr. B. E. Fryer (Kansas City) had in such cases found albuminose in the urine at times when albumen appeared to be absent.

Dr. G. Hay (Boston) said that a patient previously reported as having sub-conjunctival and sub-choroidal hemorrhages had died suddenly of apoplexy, with the urine highly albuminous.

Dr. O. F. Wadsworth (Boston) had seen the stellate spots of retinal exudation disappear entirely in cases where the albuminuria was incident to pregnancy. He had also seen these so-called typical appearances of albuminuric disease in cases of cerebral tumor and probable meningitis, without any albuminuria.

Dr. Bull does not regard the stellate patches of exudation in the region of the macula as typical, having also met with them in cases of brain tumour and meningitis.

Dr. H. D. Noyes (New York) confirmed the relatively good prognosis in cases occuring from pregnancy; also that vision often improves without any change in the ophthalmoscopic appearances.

Thrombosis and Perivasculitis of the Retinal Vessels.—Dr. G. C. Harlan (Philadelphia) reported two cases, the first of which he believed unique in the completeness of the change in the retinal vessels.

Married woman, aged 33. Father and sister died of Bright's disease. No history of specific disease; but within two years has been subject to headaches, and has had two miscarriages. On May 6th, 1886, vision in L was good. Next day it was very dim, but she could still read with it. The next day that eye was entirely blind and so remains.

Seen in June, there was albuminuria but no casts in the left eye. All the visible retinal vessels appeared as white bands with sharp edges and about the normal width, except a single minute normal twig which passed a little beyond the upper margin of the disc and across one of the large vessels. Many of the vessels were accompanied by long streaks of hemorrhage; there was also extensive white retinal exudation near the macula. In the right eye there were scattered hemorrhages and a few points of change on the vessels. Later all hemorrhages had disappeared from both. By July 15th she had a slight attack of hemiplegia, some albumen, and a few casts in the urine. Pictures of the fundus prepared by Dr. P. N. K. Schwenk (Philadelphia) were exhibited.

The second case was of a coloured woman, past middle age. Right, cataract with posterior synechiæ. Left, a large vessel running upward appeared as above described, while another large vessel passing downward presented isolated spots of a similar appearance.

Test-type for Popular Use.—Dr. W. S. Dennett (New York). It is generally agreed that the visual acuteness of school children should be periodically tested. It had been recommended that teachers be generally instructed in the method of applying such tests. But he believed the suggestion had not been generally acted upon. Again, our patients come with the most erroneous ideas of what constitutes perfect vision. It would be a good plan to have school children and the laity generally understand what good vision is. He proposed a card of test-type, all the letters of such a size as to be just recognised at a distance of five metres, with a very brief statement of the intended use of the card.

The Possible Retardation of Retinitis Pigmentosa.—Dr. H. Derby (Boston) had seen twenty-seven cases, among 13,000 patients. No one observer could come to conclusions of any great certainty and weight merely by the consideration of his own experience. A general discussion of the question was to be desired.

A brother and sister, boy eight, girl seven years old, were seen in January of the present year. Boy's vision each $\frac{2}{10}$, girl's each $\frac{4}{10}$. After three months' treatment with the

constant electric current, their vision was: boy, R $\frac{3}{10}$, L $\frac{2}{10}$; girl, R and L $\frac{6}{10}$. There was also decided improvement in the visual fields and night blindness. Diagrams of the field of vision were shown. In a girl, aged seventeen, the constant current for three months had improved central vision. Right from $\frac{12}{XL}$ to $\frac{12}{XX}$; Left, $\frac{12}{L}$ to $\frac{12}{XXX}$. Also improved fields of vision. No other treatment.

Should a patient be kept from eye work; or encouraged to pursue the usual course of education? If the course of the disease could be retarded, every precaution should be taken, looking to the accomplishment of that desirable result. In 1881, a boy, aged fourteen, with typical case of the disease, central vision $=\frac{3}{10}$ in both eyes, was advised to use the constant current and avoid eye-work. By the advice of others he continued his book studies and now has $V=\frac{1}{10}$, with corresponding progress of the disease in other respects.

Dr. Little saw, in 1877, a case in a deaf mute with syphilitic history. Vision R $\frac{20}{C}$, L $\frac{20}{LXX}$. No marked restriction of the fields of vision. The interrupted current was used, and after two or three applications, vision improved to R $\frac{20}{XL}$, L $\frac{20}{XXX}$. The mixed treatment was also used. Hearing also improved. In 1879 the improvement continued.

Dr. L. W. Fox (Philadelphia) had treated a number of cases successfully with the constant current. The best results were to be obtained by the application of the negative pole over the eye. If improvement in the area of the visual fields was not noticed after three applications, no improvement was to be hoped for from the constant current.

Dr. Harlan had noticed there was apt to be a sudden increase of the trouble about the age of puberty. He had seen two well-marked cases in which the lesion was congenital. One child had been completely blind from birth.

Dr. G. Strawbridge (Philadelphia) had given an extensive trial to the treatment by electricity without benefit to his patients. If the current strength were not carefully regulated, he would fear injury might result.

Dr. S. Theobald (Baltimore) had seen temporary improvement from the prolonged use of iron, quinine, and strychnia.

Dr. S. D. Risley (Philadelphia) had succeeded in widening the field of vision by hypodermic injections of strychnia; but

the improvement was not sustained. In a young man after the correction of his ametropia, the disease very slowly progressed for two years. Then upon using eserine for some asthenopic symptoms, there was a marked improvement. Since then he has used a very weak solution of eserine a good deal of the time, two years. The original improvement has been maintained; but if he long discontinues the eserine, his sight gets worse again.

Dr. Wadsworth. A divinity student seen in 1873, vision with -7 in each $\frac{14}{C}$, field 12″ in diameter at 1′, with night blindness and the retinal pigment spots, reading German and Hebrew: eight years later preaching in charge of a parish, vision as before, but field of vision somewhat narrower.

The Equivalence of Cylindrical and Sphero-cylindrical Lenses. —Dr. Edward Jackson (Philadelphia) demonstrated some laws of such equivalence, showing that equal crossed cylinders (that is, equal cylindrical lenses superimposed with their axes perpendicular to one another) are optically equivalent to a spherical lens of the same refractive power. Crossed cylinders of unequal refractive power are evidently equivalent to crossed cylinders of equal refractive power combined with a cylindrical lens which would equal the difference between them, and are therefore equivalent to a sphero-cylindrical lens. It was proven that any two cylindrical lenses placed with their axes oblique to one another may be replaced by crossed cylinders of the proper strength, with their axes placed in the proper direction, or by their equivalent sphero-cylindrical lens.

To determine the sphero-cylindrical equivalent of any two cylindrical lenses, construct a parallelogram, two sides of which are proportional to the refractive powers of the given lenses, while the angle these sides include is double the angle included by the axes of the given lenses. The diagonal of the parallelogram which cuts this included angle will be proportional to the cylindrical part of the desired equivalent. To get the spherical part of the equivalent, it is only necessary to subtract one-half this cylindrical equivalent from the half sum of the given cylinders. By the same method may be obtained a sphero-cylindrical lens, which is optically equivalent to any number of cylindrical lenses superimposed with their axes in any directions.

Dr. G. Hay (Boston) presented by title a paper on *The Combination of Two Cylindrical Lenses;* and made some remarks upon the preceding communication.

Dr. Dennett called attention to the observation of Dr. Loring, that after cataract extraction better vision is to be obtained with crossed cylinders than with spherical or sphero-cylindrical lenses.

Dr. Little believed that crossed cylinders were better than sphero-cylinders in some cases, the patient preferring them because he could see better with them.

Cataract Extraction, with particular reference to the After Treatment.—Dr. G. Strawbridge (Philadelphia) reported on 223 extractions not before published. The operation was a modified flap, puncture and counter-puncture one half millimetre within the cornea, and centre of incision tangent to the upper corneal margin. After iridectomy and cystotomy the lens was evacuated, formerly by pressing lower portion of the cornea with Daviel's spoon. Latterly had used the fore-finger, acting through the lower lid.

The cleansing of the eye had been accomplished in about two-thirds of the cases with simple water, in the others with a solution of boracic acid. The eye was then bandaged and the patient placed in bed. Formerly the room was darkened and the patient confined to bed for four to six days. Now he allowed the patient to sit up at the end of twenty-four hours, and on the next day to walk about. Patients of sixty years of age or upward are commonly given whiskey, and often quinine, from an early period.

Cocaine had been used on forty-seven of these patients. In the first case on which it was tried panophthalmitis ensued; which, with similar accidents that had happened to others, deterred the speaker from further trials with it for a considerable time. Subsequently he had resumed its use, making the applications in a way that secured satisfactory anesthesia, yet avoided, he thought, the dangers connected with its use. A single drop of a two per cent. solution is placed directly on the cornea, and after a minute or two the application is repeated. Immediately after this the operation is done. The result was success in 85 per cent., partial success in 8·3 per cent., failure

in 6·7 per cent. Twelve eyes were absolutely lost, one by choroidal hemorrhage, the others by suppurative choroiditis.

Cataract Extraction without Iridectomy.—Dr. H. Knapp (New York). Probably in future this operation will be extensively used. He reported six cases—(1st.) Patient of seventy-five, with large hard cataract. Failed to expel the lens until a piece of the iris had been removed; showing that a section that would be sufficient in extent with iridectomy is insufficient without an iridectomy. The anterior chamber was washed out with Panas' solution; result, $V = \frac{10}{cc}$, with pupillary opacities. (2nd.) Age 36, soft cataract, small section, healing normal; result, $V = \frac{15}{cc}$, with atrophy of the optic nerve. (3rd.) A hard senile cataract, $V = \frac{20}{c}$. (4th.) Age 60, hard, pupil left cloudy; $V = \frac{10}{cc}$. (5th.) Iritis from the fourth day, at the twenty-fifth day some pericorneal redness, pupil clouded; $V = \frac{8}{cc}$. (6th.) Age 82. A large section was made, the lens came out readily, but the iris had to be reduced. Summing up, there had been three ideal recoveries, with round, central, moveable pupil; and three cases of posterior synechia. The antiseptic precautions consisted in washing the lids with soap and water, and then with the bin-iodide of mercury solution, and washing out the conjunctiva with the bin-iodide solution. The iris certainly interferes with the exit of the lens, especially of the cortical substance. After the removal of the lens the iris commonly falls back of itself, or is readily reduced by the injection of Panas' solution into the corneal wound, which is conveniently accomplished with a Meyer's lachrymal syringe. That no incarceration of the iris in the corneal wound occurs is due, he believed, to the action of cocaine; which, by lessening the tendency of the iris to prolapse, rendered this modification of cataract extraction possible. The visual acuity obtained, and the need for secondary operations, will decide the value to be attached to the operation; but great advantages are the freedom of the corneal wound from iris and fragments of lens substance, and the retention of a small, central, round, moveable pupil. Meyer's syringe, and Koch's, which can be perfectly sterilised, were exhibited.

Fifty Cases of Cataract Extraction.—Dr. D. Webster (New York). These were done on forty-three patients. Of the

seven who had both eyes operated on, five had the operations done at different times, and in two they were done at the same time. Of the latter, all four eyes did well. Where the patient did not consult the surgeon until both eyes were ready for operation he believed it generally better to extract both at once, for such patients generally lived at a distance and would not protract their stay or return later to have the second eye operated on. They would be better to have the sight of both eyes, it enlarges the visual field; a hypermature cataract may come to act as a foreign body, and the risk is not materially increased by doing the double operation. All cases treated with a preliminary iridectomy did well. Twenty-four got good vision by the primary, and seventeen more by secondary operation, making forty-one successes. There were six partial successes and three failures. Boracic acid and biniodide solutions were used for cleansing the eye. Ether was used for seventeen, cocaine in twenty-seven, and no anesthetic for six eyes. The longer he uses cocaine, the less he finds it necessary to apply to secure the desired effect. In the later cases two or three drops of the four per cent. solution, instilled a drop at a time, sufficed.

Death on the Fifth Day after Cataract Extraction.—Dr. H. D. Noyes (New York) reported the case. The patient was a woman; the operation performed satisfactorily, and healing progressed normally until the fifth day after the operation, when she felt suddenly prostrated, went into a condition of syncope, and died an hour-and-a-half later. The autopsy revealed dilation of the heart and valvular insufficiency. The orbital contents were removed *en masse;* the corneal wound being partly opened by violence in the process. Ten sections of the anterior segment of the globe, parallel to the vertical diameter of the cornea, were exhibited. Before death union had been smooth and apparently perfect. But these sections showed that the central portion of the wound was still open inward with the iris lying in it. Union had occurred apparently through the action of the epithelium exclusively.

Dr. B. J. Jeffries (Boston) thought in using cocaine it was well to drop it in both eyes. Its presence in the eye not to be operated on secured greater steadiness of both. He also

proposed a modification of Arlt's double hook for extracting the lens, where such an instrument was necessary.

Dr. C. R. Agnew (New York). A single minim of a four per cent. solution of cocaine placed on the cornea, with perhaps a single repetition if the effect is found insufficient at the end of three or four minutes, is all that is necessary to secure the anesthetic effect. In earlier cases he had used it more freely, and he now believed too freely. He had learned to keep his cleansing fluid in a vessel which prevented it from collecting the germs floating in the air. Thirty years ago he had learned from Wilde the plan of simply closing the eye by two strips of isinglass plaster. The practice had been given up under the influence of the teachings of Von Graefe. It has never been the practice in New York to exclude the light from such patients.

Dr. Green had never shut a patient in a dark room after cataract extraction.

The President asked if Dr. Agnew's method of using cocaine secured anesthesia of the iris.

Dr. Agnew replied that if it was insufficient a drop could be instilled after completing the corneal section.

Dr. W. F. Mittendorf (New York) had seen two cases of complications that he attributed to cocaine. After instilling cocaine it is well to keep the lids closed to protect the corneal epithelium as far as possible. Dr. Noyes' observation as to the part taken by the epithelium in the healing process indicated the especial importance of such protection.

Dr. W. Thompson (Philadelphia) had one time been furnished with a solution of two grains to the ounce, instead of two per cent.; and from its satisfactory use had learned that weak solutions are effective.

Dr. Gruening said that De Wecker extracted cataract without iridectomy in the winter; but stated that in summer the restlessness of the patient was liable to cause prolapse of the iris. Had operated in this way on two cases, instilling eserine and cocaine. In the first the lens was easily delivered and the iris returned spontaneously. But at the first dressing pressure caused prolapse of the iris, making iridectomy necessary. The second was not dressed until four days. Good results in both. He should cultivate the method. Difficulty of removing

the cortical substance rendered the use of the syringe necessary. Cocaine as a six per cent. solution had been instilled several times at intervals of a few minutes into an eye that was to be subjected to sclerotomy for glaucoma, the eye being kept open. When he came to operate, a little pressure at the sides of the eye caused the whole corneal epithelium to rise upon a clean bleb. The anterior chamber was empty and the eyeball soft.

Dr. Thompson had a case of glaucoma in which cocaine entirely failed to produce analgesia, so that he had to use ether. Subsequently the same solution of cocaine was instilled and found to produce its ordinary analgesic effect.

Dr. Noyes had done six cases of extraction without iridectomy. Cocaine was used in all. Using the antiseptic solution and clearing the anterior chamber was a matter of manipulation and irrigation. He believed syringes unnecessary, using instead the rubber bulb employed in washing out the conjunctiva, the forcible direction of the stream from it upon the wound serving to clear the anterior chamber. Eserine was used to keep up the contraction of the pupil after the operation. The eyes were kept closed three or four or even five or seven days. In three cases the result was a perfectly circular central pupil with accurate vision. In one there was spontaneous intraocular hemorrhage. In two cases the iris prolapsed when the eye was opened, one on the seventh day. In one of these the ultimate result was satisfactory ; in the other it was not. Cases for this operation must be carefully selected, and the method with iridectomy is somewhat safer.

Dr. Theobald, using several instillations of cocaine before passing probes for lachrymal stricture, noticed in one case that the corneal epithelium was invariably roughened and abraded. Repair would be complete two days later, but in one case of foreign body it was noticed to last over two days.

Dr. Fryer had used cocaine in ten cases of extraction. He instilled a drop of the solution each half-hour for four or five times, thus securing complete anesthesia of the iris.

Dr. B. A. Randall (Philadelphia). Iridectomy was introduced to avoid iritis. In thirty cases he had seen while in Paris no iritis occurred. He had secured a small mobile and in the main round pupil by a very small iridectomy.

Some Medico-Legal Cases.—Dr. B. J. Jeffries (Boston) cited a series of cases showing the inefficiency of certain state laws to secure the proper visual testing of railway employees, mainly for lack of established standards for form and colour perception, for the various duties required, and for want of provisions for competent expert examiners. Attention was called to the worthless character of some specimens of coloured wools in use. The necessity for international standards of requirement as to colour vision in sailors, pilots, and officers of vessels was also illustrated by a considerable number of cases.

A Series of Wools for the Scientific Detection of Sub-normal Colour Perception.—Dr. C. A. Oliver (Philadelphia) reviewed the principal methods of detecting colour blindness. The assortment of coloured wools was to be preferred. He had found that a few of the most intelligent of the blind could make some assortment of colours by touch, but that it was not of such a kind as to practically interfere with the working of such a test. In the series offered, the Holmgren test had been improved upon, by the addition of two test skeins—blue and yellow—which practical experience had shown of value as confirmation tests in incipient nerve disease. Thus there were five test skeins of pure colours. Then there were two tints and two shades of each of these pure colours, and, finally, seventy-two confusion match skeins. All the colours are chosen of equal relative intensity, thus preventing inaccurate results, due to skilful shading. Each skein has a bangle attached, on which the pure colours are designated by the initial of their Latin names, while the various tints have in addition figures representing their relative intensity. Thus the significance of each wool selected can be instantly read from its attached bangle. The tests are separate, and any order of testing may be adopted. The test can be applied by an intelligent layman, and the results obtained submitted to the expert. Quantitative as well as qualitative testing of the colour sense is thus secured. Accurate notings of passing changes can be secured and preserved for future comparison, leading to the more accurate study of disease, better prognosis, and more useful plans of therapy. Exact verbal expression

of the character and amount of defect can be given, and the vague terms now employed can be discontinued. All the wools are of the same grade of manufacture.

Holmgren's and Thomson's Worsteds in a new form.—Dr. W. S. Dennett (New York) exhibited a set of the coloured worsteds, each colour made up into a ball. In this shape they could not get tangled; they would all be seen at once, with the light falling on them all alike. Each ball can be numbered, the numbers corresponding to those adopted by Dr. Thomson in his colour test. (See also Jeaffreson, O. R., p. 248).

Dr. Jeffries feared it would be impossible to get any tradesman to exactly duplicate Dr. Oliver's tests.

Dr. Oliver thought it could be done, and urged the advantage of its having a scientific basis.

The Electric Light as an Illuminator.—Dr. J. A. Andrews (New York) reviewed very fully the reported cases of injury to the eyes by excessive light. Most artificial lights have a predominance of long wave rays. The arc electric light has a predominance of short wave rays, especially when the current is too strong. It is the latter which produce the greater chemical effect. He believed the symptoms produced by it to be due rather to reflex nervous disturbance than direct mechanical injury. It would be very apt to intensify previously existing pathological conditions, and in reported cases these had not been rigidly excluded. The arc light in its present form should be rejected as harmful, especially on account of its unsteadiness. The examination of 1,100 persons using the incandescent electric light showed not a single eye injured by it. Many suffering from choroidal and retinal disease had experienced great relief from its adoption in the place of gas and coal oil. The amount of heat from it is comparatively small; it is perfectly steady, and consumes no oxygen. It should be recommended as the best form of artificial light.

Dr. Agnew. The incandescent electric light had been placed in a reading room at Columbia College two years ago, and had proved very satisfactory to all who used it. A number of persons with specially sensitive eyes had obtained special

permission to avail themselves of it for their regular night work, because preferable to other sources of light which they previously used.

Dr. Mittendorf wished to confirm Dr. Andrews's estimate of the incandescent light; patients with specially sensitive eyes unite in declaring it the most pleasant source of artificial light.

A Method of Overcoming Diplopia.—Dr. W. S. Little (Philadelphia) used in paresis or paralysis of the ocular muscles a glass with enough of the surface ground to obscure the vision of the deviating eye in the portion of the field affected by the diplopia. Sometimes, however, accidents or inconvenience would occur from the patient looking under or to one side of the glasses. To meet this he had a piece of wire gauze fastened to the frame around the glass and accurately fitted to the face. It was light, could be painted any colour so as to be not at all noticeable, and gave entire relief from the diplopia.

Dr. Harlan used a piece of paper pasted on the glass.

Two Epidemics of Molluscum Contagiosum.—Dr. W. F. Mittendorf (New York). The contagiousness of this affection is disputed, but he had been convinced of it by two epidemics occurring in homes for children on Staten Island. At St. Stephen's Home a little girl was admitted with it, and three months later twenty-seven of the children were affected. In some the growths were confined to the eyelids; in others the whole face was affected. At the Nursery and Child's Hospital forty-one of the inmates were affected, besides a nurse and her child. From this institution many of the children are boarded in the families of neighbouring farmers. One farmer had twenty of them. A new child came, suffering with molluscum, and soon eleven of its companions were affected, besides the farmer's wife and child. In three cases recovery was spontaneous. The others seemed amenable to treatment, which consisted in removing the growths with curved scissors and cauterising the base, giving ether where they were more deeply situated.

Melano-Sarcoma of the Conjunctiva and Cornea. — Dr. Mittendorf reported the case, occurring in a woman aged 46.

Three times the tumour had been removed, and was now returning. Although her general health is still good, the neighbouring glands are involved.

Dr. Noyes mentioned a case of melano-epithelioma removed, with no return after four years; and another in which there was no return after six years.

Dr. Knapp had seen several such cases, but the growth had always returned.

Dr. Randall had seen in Jæger's clinic a large melano-sarcoma that was pedunculated and apparently tending toward spontaneous recovery when removed; also a case of alveolar sarcoma, of which he showed a photograph, where there had been no return some months after removal.

Dr. J. A. Lippincott (Pittsburg) had removed a melanotic tumour three years ago, with no return up to the present time. In this case the eyeball had been removed, although vision was almost perfect.

Hot Water in Conjunctival and Corneal Inflammations.—Dr. B. E. Fryer (Kansas City) used the water as hot as it could be borne. After a few applications a remarkable tolerance is established, so that it can be used at 140° Fahr. or upward. Used it as a fomentation for say a half-hour every two or three hours, or by continuous dropping. In bad cases made the applications constantly. In gonorrhœal ophthalmia had thrown it directly into the conjunctival sac. In purulent conjunctivitis it is certainly superior to iced cloths. Also useful in catarrhal and phlyctenular conjunctivitis and keratitis. Its most markedly beneficial effect is in corneal ulcer, relieving pain and photophobia and lessening the amount of ultimately opaque cicatricial tissue. He also used warm water to remove any excess of astringent applications to the lids.

Dr. J. S. Prout (Brooklyn) has for many years had a "prejudice" against cold water. Uses it hot.

Dr. Norris had good results from the use of hot water in gonorrhœal ophthalmia.

Dr. Theobald has used it in interstitial keratitis, lessening photophobia and tendency to opacity.

Remarks on Asthenopia and on the Changes of Refraction in Adolescent and Adult Eyes.—Dr. W. F. Norris (Philadelphia).

During childhood the antero-posterior axis of the eyeball normally increases from 17 mm. to 24 mm. Even to stop at the highest grade of hypermetropia it must increase 4 mm., while to reach emmetropia the increase must be 7 mm. At this age the sclerotic is soft and easily distended. All use of an organ is accompanied with hyperemia, swelling and increased exudation of serum. During rest the hyperemia disappears, the swelling subsides, the excess of serum returns to the circulation. This occurs in the eyes as elsewhere. When the use is too prolonged asthenopia arises. When the rest is insufficient the hyperemia and swelling become permanent, causing the giving way of the sclerotic at its softest and most vascular portion, this process being strongly favoured by any constitutional dyscrasiæ. In this way arise myopia, with or without astigmatism, mixed astigmatism, or even conical cornea. Over-use of the eyes brings on asthenopia. At first conjunctival irritation, discomfort, heaviness of the lids. Persistence in eye-work brings on pain, which may shoot through the eye or involve the head. This is attended with retinal congestion and swelling, with choroidal distension. The walls of the larger retinal vessels alter in refraction so that they become visible to considerable distances from the disc, and the lymph sheaths are noticed in various parts as silvery reflexes. Pain is usually complained of early in myopia, being less severe as the sclerotic gives way. It differs in character from the neuralgic pain of high hypermetropia, which is largely influenced by instability of the general nervous system. Many cases of constantly recurring conjunctivitis and blepharitis are relieved by glasses. When the symptoms of asthenopia are present it is always worth while to correct the ametropia present, no matter what its degree. In many the relief afforded is complete; in others it is, although considerable, only partial. This is especially the case with the neuralgic. Such patients often feel worse in the morning. Often with improved health they can lay their glasses aside. A series of cases was then reported of patients who had been from time to time under observation for long periods and repeatedly examined after the prolonged use of atropia. In six of these there was diminishing hypermetropia; and in six others hypermetropia had passed over into myopia. In conclusion it is to be

remembered that diminishing hypermetropia and increasing myopia are but different phases of the same process; that to check this process the existing ametropia should be corrected, and the prolonged use of a mydriatic is necessary to determine it. Cases of hypermetropia with great difference between the refraction at the disc and at the macula should be watched, as cases of distension liable to progress toward myopia. Dark glasses should be worn during the mydriasis to avoid the chance of starting up a choroido-retinitis.

Dr. Theobald had reported cases of progressive astigmatism which he had thought due to change in the curvature of the cornea, but now accounted for by a relaxation of irregular contraction of the ciliary muscle which had at the earlier date partially corrected it.

Dr. Harlan thought that change in refraction usually meant change in the length of the optic axis, though it might be due to change of corneal curvature. He narrated a case passing from hypermetropic to myopic astigmatism, with increase of astigmatism.

Dr. Gruening found cases feeling irritation of the eyes and pain in the morning unrelieved by glasses; the trouble being due to nasal disease, which was aggravated by remaining in the recumbent posture. Of 200 cases treated on this supposition 150 had been benefited.

Dr. S. D. Risley (Philadelphia). Disease within the nose does not account for increased length of eye-ball. Myopic patients are recruited from the hypermetropic not the emmetropic. This conclusion was based on the observation of a series of cases which he had from time to time published where H passed over into M, and upon his studies of the eyes of large numbers of school children. He cited a case where hypermetropic passed over into myopic astigmatism, and during bad health this became conical cornea. Under mydriatics, eserine, and the pressure bandage the eye recovered so far that a strong cylinder gave vision $= \frac{20}{\text{XXX}}$ and comfort. He had seen cases of progressive myopia where the distension and thinning of the sclerotic occurred anteriorly.

Dr. Randall had been struck by the importance of physiological growth in the causation of myopia. Was there any reason for saying that we could recognise in the cradle the eye destined to be myopic?

Dr. Norris had only given cases where the change of refraction was to be looked upon as due to axial change. He had notes of others where it was due to change in the curvature of the cornea.

The Amblyopia of Squinting Eyes: Is it a Determining Cause or the consequence of a Squint?—Dr. S. Theobald (Baltimore) favoured the latter view. Cataract may continue years without causing amblyopia by exclusion of the eye from the act of vision. The amblyopia of squinting eyes is peculiar, involving especially certain parts of the retina, the macula and portion on which the false image is projected. Such a degree of amblyopia without any appreciable change in the appearance of the fundus is certainly very unusual except in squinting eyes. The re-establishment of binocular vision after the correction of the squint indicates that retinal identity has been established before the amblyopia occurred. Amblyopia may favour the production of squint, but hypermetropia is certainly the most frequent cause of it. He would favour early operation, so as to give the patient the benefit of any doubt.

Dr. Noyes disputed the speaker's conclusions. It is not proven that squinting patients have ever had binocular vision. He has seen many patients without squint who were congenitally amblyopic. In his experience binocular vision was only obtained in twenty per cent. of the cases operated on. Improvement in vision after operation is very rare.

Dr. Wadsworth agreed with Drs. Noyes, Schweigger, and Graefe that the amblyopia was primary. Had observed in two children, 8 or 10 years old, squint coming on after impairment of vision by phlyctenular keratitis. Had also seen cases of central and para-central scotoma that had never squinted. In testing young children just commencing to squint, they often make an instinctive effort to look with the good eye, showing they are previously accustomed to depend on it. He had never been able to get improvement of vision after operation.

Dr. Harlan has not obtained improvement of vision by operation, but has obtained it by subjecting the good eye to a

mydriatic, and compelling the patient to use the squinting eye. Thus in one case the vision improved from $\frac{20}{CC}$ to $\frac{20}{L}$. In cases of amblyopia without squint, careful questioning often reveals that squint has been present at some former period, but has spontaneously disappeared.

Dr. Mittendorf. Marked improvement of vision does sometimes occur immediately after operation. This might be due to the influence of tenotomy on the corneal curvature.

Dr. Theobald. If the amblyopia is commonly congenital, squint should as a rule occur earlier than it does. He had not observed such cases of amblyopia without any fundus changes.

Multiple Rupture of the Eye-ball, with partial Dislocation of the Lens into the Anterior Chamber—Recession and Recovery with some Vision.—Dr. B. A. Randall (Philadelphia). This was the case of a man, aged 30, who struck his eye by running against a projecting board. There were three stellate subconjunctival ruptures of the sclera. The upper part of the lens projected into the anterior chamber. In a few days the lens had returned behind the iris. The patient at first could only count fingers at one foot. Two months later $V = \frac{15}{C}$. Lens inclined to fall backward with slight points of opacity, and shreds in the vitreous. The treatment embraced the bandage and rest in bed.

Subluxation of the Lens with Double Rupture of the Choroid—Recovery with good Vision.—Dr. Randall. This was in a boy of 12, struck on the eye by a flying chip. Had at first only light perception. Treated with atropia and the pressure bandage. At the end of a week the upper margin of the lens was seen in the pupil, and the choroidal ruptures were visible. The retinal vessels were nowhere torn. There was myopia with five dioptries of astigmatism. The choroid near the ruptures and elsewhere was inflamed and afterwards underwent atrophy. After several weeks there was a low degree of hypermetropic astigmatism. Vision $= \frac{6}{XII}$ partly, and accommodation = 5 D. Pictures of the above cases were exhibited.

Laceration of the Infra-trochlear Nerve—Badal's Operation.—Dr. J. S. Prout (Brooklyn). This operation was worthy of attention for the relief of certain cases. This is the branch of

the superficial orbital nerves most intimately connected with the nutrition of the eyeball. It is easily found, is then raised on a strabismus hook, pulled and ruptured. It is not necessary to separate the accompanying vessels, which would be a difficult and tedious process. There is rather sharp pain at the instant of rupture, but an anesthetic is not generally required. The operation is only to be resorted to when the eyeball cannot be touched. He had done the operation nine times on five unpromising cases. First case, glaucoma simplex, vision improved from $\frac{20}{XL}$ to $\frac{20}{XX}$, but was finally lost. Second, syphilitic history; iridectomy the year before had not helped it, neither did this operation. Third, hemorrhagic glaucoma; sclerotomy had improved it previously; improved as to pain, not as to sight. Fourth, simple glaucoma; operation failed to relieve. Fifth, hemorrhagic glaucoma: high tension, great pain, and bare perception of light; pain completely relieved, tension became nearly normal, vision improved; but subsequently pain returned and sight was lost. Conclusion: the operation should be used in hopeless cases for the relief of pain. Dr. Prout then read for Dr. Webster the report of a case in which the pain and increased tension had been at first partly and afterwards entirely relieved by this operation.

Dr. Bull. In several cases it gave marked temporary relief, but later pain returned.

Dr. Knapp showed the rabbits which he had operated on in the presence of the Society the previous day. In both the infected eye was the seat of violent pan-ophthalmitis, while the non-infected eye appeared to be healing normally with very moderate re-action.

Advancement of Tenon's Capsule.—Dr. H. Knapp (New York). The ordinary strabismus operation has weak points, therefore he had tried De Weker's operation, modified by introducing a third central stitch and leaving a somewhat larger conjunctival flap toward the cornea in ten cases. In two cases of paralysis of the external rectus he had stitched the tissues to the external commisure with good effect. In two cases previous tenotomy had been insufficient. In six cases there was a high degree of squint and amblyopia. For these the operation seemed especially appropriate. Panas' liquid

was used as an antiseptic. The stitches were commonly left in until the third or fourth day. In no case was there alarming reaction. On the whole his experience had been encouraging.

Dr. Harlan had done it several times, until the occurrence of a panophthalmitis had made him cautious. Did Dr. Knapp regard it as entirely safe?

Dr. Knapp had not formerly regarded it as safe, but his opinions had been changed by his recent experimental work, and by seeing what was done with aseptic precautions in European clinics.

Dr. E. E. Holt (Portland) had been doing the operation four or five years. Of twenty-seven cases, but one had been complicated as to healing, and here the ultimate result was good. It was particularly valuable for cases with nystagmus.

Tumour of the Left Occipital Lobe with Right Homonomous Hemianopsia.—Dr. E. Gruening (New York). Man aged thirty-five, with good history. Began with pain in left temporal region; six months later vision was impaired. Line of demarcation, vertical 2° from the fixation point. Central acuity $\frac{20}{L}$. Good colour perception. Muscles normal. Later there was double choked disc. The lower left half of the face became paretic, and sensibility was diminished in the extremities of that side. There was also slight amnesic aphasia. Autopsy: Left hemisphere, enlarged hard mass in the tip of the left occipital lobe; most of the second and third convolutions softened. The tumour was encapsulated and hard, involving the white substance, including that beneath the *gyrus angularis*. Optic nerves, chiasm, and tracts normal. Microscopically, the tumour was a spindle-cell sarcoma.

Anomalous Formation in the Vitreous of both Eyes.—Dr. J. S. Prout (Brooklyn) exhibited sketches of, and described a case in which a linear opaque band came from the fundus of each eye, arched forward through one-fourth of the optic axis and returned to the fundus. There was no connection with the optic disc; with −6 D. V = $\frac{18}{L}$ in both eyes.

Dr. Harlan had recently seen an eye where such a band arose from one side of the optic disc and passed forward towards the ciliary region; a small blood-vessel could be distinguished upon it at one point.

Lens Series for the Refraction Ophthalmoscope.—Dr. E. Jackson (Philadelphia) called attention to a number of these specially adapted to the ophthalmoscope he had devised. All such series are to be arrived at by some compromise between convenience and completeness, and choice is largely a matter of individual preference.

Test Type.—Dr. J. Green (St. Louis) showed two new arrangements of test letters. Both were mounted in boxes to protect them from dust. One on a continuous sheet which passed over two rollers that could be turned to bring only the desired type into view. In the other the letters were printed on cardboard, and several cards suspended from two hooks, so that these cards could be turned up or down to exhibit any desired letters. He also presented a series of block figures of common objects useful in testing young children.

Metric Test Types for determining the amount of Accommodation.—Dr. C. A. Oliver (Philadelphia) called attention to block letters accurately reduced by photographic processes, so that they could be used to test the vision as accurately at one-fourth or one-half a metre, as with the ordinary test letters at twenty feet. These were to be arranged in a series of short words and used for obtaining the near point of distinct vision.

Photograph of a Brain showing Want of the Optic Commisure.—Dr. Little presented this for Drs. Wilmarth and Kerlin, of the Pennsylvania Training School for Feeble-minded Children. The case was of an idiot boy who had divergent squint and nasal hemianopsia. There was deficiency of the posterior and middle commisures; occipital lobes normal.

Pregnancy, Albuminuric Retinitis, Induced Premature Labour.—Dr. S. D. Risley (Philadelphia). The patient, aged thirty-five, had albuminuria in an earlier pregnancy, and subsequently passed through one without the appearance of albumen. Early in the fifth month began to have headache, then impaired vision and albuminuria. When seen there was waxy pallor, vision: R, fingers at two feet, L $\frac{10}{cc}$; ophthalmoscopic appearances of albuminuric retinitis, urine becoming almost solid with boiling. With difficulty she was persuaded to submit a week later to the induction of premature delivery; after

which she remained four days unconscious, with urine loaded with albumen. Gradually the albumen lessened, and as consciousness returned aphasia and amnesia were found to be present. One month later, aphasia still persists, some albumen, no casts in the urine, sees better. Eight months later, there are still traces of aphasia; vision = R $\frac{20}{\text{xxx}}$; L $\frac{20}{\text{xx}}$.

The Hemispherical Wire Perimeter of Dr. E. Dyer (Newport), with the addition of a registering apparatus, was presented by Dr. Dennett.

Modified Loring Ophthalmoscope, with Cylindrical Lenses.—Dr. Randall presented this instrument. The cylindrical lenses are arranged in a third disc, which can be turned about the sight-hole so as to present them with their axes in any desired direction.

Frequent Instillations of Nitrate of Silver in Purulent Ophthalmia.—Dr. J. A. Andrews (New York). A two per cent. solution was used. Its instillation could be entrusted to persons not specially skilled in manipulating the eye. In twenty-five cases of severe gonorrhœal ophthalmia treated thus no eye had been seriously damaged. It was instilled three or four or five times a day and caused comparatively little pain. Its frequent repetition was indicated by the swelling, particularly the chemosis.

Dr. Mittendorf would use it cautiously. Had seen both corneæ opaque from the use of such a solution, but no chemosis was present when it was instilled.

An Impervious Sponge Cover for Ether Inhalations was exhibited by Dr. R. Murdoch (Baltimore).

Measurement of Astigmatism by the Ophthalmometer of Javal and Schiotz.—Dr. Noyes, comparing the results obtained with this instrument with those obtained by using the ophthalmoscope and test lenses, found them accurate to within a half dioptric. The tendency of the instrument was to give rather higher grades of astigmatism than other methods. In amblyopia it was valuable as fixing the diagnosis.

Burns by Fulminate of Silver and Fulminate of Mercury.—Dr. Noyes wished to record these cases, burns by the fulminates having peculiar characters.

Foreign Bodies in the Globe.—Dr. Noyes gave two cases in which the foreign body was spontaneously expelled with the retention of considerable sight. In one the anterior chamber was so deep and the eye so prominent that he could get a reflex from the posterior surface of the cornea. Also two cases of failure to extract bits of steel with the electro-magnet. In one it was impacted in the sclera; in the other it was embedded in the head of the optic nerve, and had been there two years without causing irritation.

The Society adjourned to meet at New London, Wednesday, July 20th, 1887.

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A. Retina. Optic Nerve. Centres.

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B. Uveal Tract. Vitreous and Aqueous. Lens.

Agnew, C. R. The after-treatment in cataract and iridectomy operations.
N. Y. Med. Record, July, 1886, *p.* 108.

Agnew and Webster. Case of painful glaucoma absolutum of traumatic origin.
N. Y. Med. Jour., July, 1886, p, 100.

C. Cornea. Conjunctiva. Sclera.

On lesions of the cornea following the instillation of cocaine.
Brit. Med. Jour., August 1886, *p.* 259.

Weeks, J. E. Ophthalmia neonatorum—its cause, prevention, and treatment.
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D. Accommodation. Refraction. Motor Apparatus.

Browne, E. A. The genesis of short sight.
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Loring, E. G. Dioptric, Dioptre, Dioptrie, or Dioptry?
N. Y. Med. Jour., July, 1886, *p.* 95.

E. Eyelids. Lachrymal Apparatus. Orbit.

Armaignac. Tumeur lipomateuses symmétriques, probablement congénitales, aux deux paupières supérieures. Exstirpation ; deux récidives. Guérison.
Rev. Clin. d'Ocul., 3, *p.* 49.

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Rev. Génér. d'Ophth., 4, *p.* 145.

Dianoux. Traitement du ptosis.
Ann. d'Ocul., *May—June*, 1886, *p.* 237.

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F. Miscellaneous.

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Ann. d'Ocul., *May—June*, 1886, *p.* 250.

Armaignac. Sur les nœvi de l'œil et des parties voisines.
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Chibret. Skiascopie ; ses avantages : sa place en ophthalmologie.
Arch. d'Ophth., *VI.*, 2, *p.* 146.

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Rec. d'Ophth , 3, *p.* 129.

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ZONULAR CATARACT AND DENTAL MALFORMATIONS.*

By John B. Story, M.B., F.R.C.S.I.,

Surgeon to St. Mark's Ophthalmic Hospital, Dublin.

It is more than twenty years since Prof. Horner, of Zurich, first called attention to the connection between the occurrence of zonular cataract and certain dental deformities, which he attributed to the influence of infantile rickets. Prior to the publication of Horner's observations, Prof. Arlt, of Vienna, had noticed that individuals with zonular cataract presented generally a history of infantile convulsions, and he based upon this fact a theory as to the etiology of this peculiar form of cataract, viz., that in the convulsions some solution of due physiological contact took place between the denser central portion and the more fluid peripheral fibres of the lens, and that this purely mechanical lesion manifested itself as a stationary zonular opacity. Horner also observed the frequency of infantile convulsions in these cases, but noticed in addition that these patients exhibited cranial deformities, defects in intelligence, and a peculiar malformation of the teeth, all of which defects he traced to the action of rickets. Of sixty-five cases observed by Arlt and Horner collectively, forty-eight possessed a history of infantile convulsions, and in

* Read before the Pathological Section of the Academy of Medicine in Ireland, November 6, 1885.

Horner's thirty-six cases he noticed twenty-five with dental deformities, sixteen with malformed crania, and four with defective intellectual development.

The dental deformity in question must not be confounded with that ascribed by Hutchinson to congenital syphilis. It is, on the contrary, precisely similar to what Hutchinson has attributed to the use of mercury in infancy—Hutchinson in this matter also bringing in convulsions indirectly—the convulsions lead to the use of mercury, which, by setting up stomatilis produces the dental abnormality. Horner's "rachitic teeth" are, as a rule, thicker and coarser than the normal; the neatly-formed incisor appears somewhat cubical and shapeless, though the shape can in many cases very closely approximate to the normal. The enamel instead of gradually thinning away on the neck of the tooth terminates abruptly in a swollen ridge. The delicate horizontal furrows to which the enamel owes its satin-like appearance become so enlarged as to be even visible to the naked eye, and sometimes, especially towards the cutting edge, a horizontal row of round holes marks the position of one of these excavated grooves. The body of the tooth terminates in a convex border at the cutting edge. The junction of the labial and lingual surfaces of the enamel runs as an irregular zigzag line over the surface of the tooth. Sometimes the enamel is quite absent in the grooves, the floor being formed by the discoloured dentine.

In corroboration of Horner's observations, the following nine cases of zonular cataracts seem worth recording* :—

Case 1.—Nannie B., aged 19. (No. 387, Nov., 1885.) Eyes always defective; had convulsions in infancy. Teeth with "rachitic" markings; not very characteristic on upper

* Four of the cases were exhibited at the meeting on November 6, 1885. Three others only came under observation subsequent to the writing of this paper.

incisors, but typical on first molars; mouth and jaws very small, and curious abnormally shaped head. The eyes are myopic, $V = \frac{6}{24}$ with each eye and Jæger No. 1. The central portion of both lenses occupied by typical zonular cataracts, that in the right eye somewhat larger than in the left, but both blocking up the pupils, except when the illumination is pretty dull. There is a second faint but distinct zone of opacity in each lens outside the principal cataracts.

CASE 2.—Margaret O'C., aged 15. (No. 388, Nov., 1885.) Eyes bad as long as she can remember; had convulsions badly when a child. Teeth markedly "rachitic." Right eye, $V = \frac{6}{24}$ and Jg. 8. Left, $V = \frac{6}{36}$ and Jg. 16. Zonular cataracts in both eyes.

CASE 3.—Bernard C., aged 21. (No. 565, Mar., 1886.) Sight defective "ten years." Never had convulsions; had whooping cough and measles at age of 2, and scarlatina and smallpox at about age of 4. No dental peculiarity visible. Right eye, V = fingers at 6m. and Jg. 18. Left eye, $V = \frac{6}{36}$ and Jg. 16. The centres of both lenses occupied by dense opacities, which seem to be nuclear and not zonular, for no illumination can be got through them, and their density seems to be greatest in the polar axis. Outside these nuclear cataracts, however, there is in each eye an irregularly shaped zone of fainter opacity, which must be regarded as a distinctly lamellar cataract.

CASE 4.—Hugh M., aged 13. (No. 156, Jan., 1885.) Failing sight for many years; speaks quite unintelligibly, and so appears deficient in intelligence. Had convulsions at age of 5 months. For seven months was so bad with "spurious" croup that his life was despaired of. Teeth markedly "rachitic." Double zonular cataracts. Only counts fingers with each eye.

CASE 5.—Mary M., aged 33. (No. 4481, Feb., 1886.) Sight failing two years; sees better in a dull light. Incisors normal, all first molars carious beyond examination. Right, $V = \frac{6}{60}$ and Jg. 16. Left, $\frac{6}{60}$ and Jg. 16. Zonular cataract in each eye.

CASE 6.—Clara S., aged 23. (No. 3100, Nov., 1882.) Married, has two children; suffers from pains in forehead all

her life "like a knife scraping the bone;" latterly it has come into the eyes, and she got glasses four weeks ago, which have made a marked improvement in the eyes. $V=\frac{6}{24}$ in both eyes. Right with -1 D, V = a few letters of $\frac{6}{6}$. A zone of dotted opacities in both lenses about half way between the centres and the equators, not a typical case of lamellar cataract, but to some extent an approximation thereto. Teeth normal.

CASE 7.—William R., aged 4. (No. 3141, Dec., 1882.) Always healthy; never had convulsions, but had whooping cough and measles. Mother has had two still-born and two living children. Right eye, well marked zonular cataract. Left, a faint haze of the whole lens, but no definite zonular band visible. No note of teeth.

CASE 8.—Wm. L., aged 17. Always been short-sighted. $V < \frac{5}{50}$ with -11 D $= \frac{5}{30}$ right and left. Both eyes read Wecker No. 2. Had convulsions as an infant 1½ years old; none of the rest of the family had them. So-called "rickety" teeth beautifully represented. An elder brother of Mr. L.'s had also the "rachitic" teeth typically shown. No definite opacity could be seen in his lenses, and he had not had convulsions as a child.

CASE 9.—Michael C., aged 24. (No. 107, June 4th, 1886.) Sight always defective; patient always healthy; has a well-shaped head. All the first molars typically "rachitic;" none of the other teeth abnormal. Right eye, $V=\frac{6}{18}$ and Jg. 1. Left, $V=\frac{6}{18}$ and Jg. 1. In both eyes rather small central cataracts of the zonular variety, but not typical examples. Both cataracts are triangular rather than circular in shape, and have neither the peripheral dull line nor the less degree of saturation in their centre that are usually observed in zonular cataracts. In the left, however, there can be seen a second nuclear opacity inside the fainter more peripheral opacity, so that the latter must be regarded as distinctly lamellar. Refraction not noted, but fundus recorded as exhibiting "myopic crescents."

In these nine cases the condition of the teeth is noted eight times, and in only two of these cases (Nos. 3 and 6) were the teeth normal. In the other six the "rachitic"

deformity was always present except in one (Case 5), when the incisors were normal, and the first molars, the teeth commonly most affected, too much decayed to be worth examination.

While in accordance with Prof. Horner's terminology the epithet "rachitic" is applied to the teeth in these cases, it is by no means to be understood that this deformity is in all cases produced by rachitis, nor even that rachitis is the commonest cause. All the evidence is in favour of the view that the dental defect is due to an arrest of development of the teeth, and it must be admitted that such an arrest of development could be produced by many other conditions besides rickets. Any constitutional or local lesion affecting the nutrition of a tooth during the period of growth of the enamel organ may conceivably produce the characteristic defect. I say the enamel organ because, although I learn from my friend Dr. Stack that the dentine is also implicated, the typical defect is to be found in the enamel. Now the period of growth of the enamel organ of any tooth is of only limited duration, and we may fairly conjecture that in time further observations will enable our odontological confrères to determine what are the conditions which result in producing this peculiar defect in the enamel. Tomes, quoting Majitot, places the growth of the enamel orgán between the sixth month ($6\frac{1}{2}$) and the ninth. An accurate life history of the child during these months should enable us to ascertain what are the possible causes of the dental defect.

It is, of course, very uncertain that the defect in the lens is due to the same cause as the defect in the teeth. The great frequency of the so-called "rachitic" teeth, and the exceeding rarity of zonular cataracts (unless we conclude that all or nearly all juvenile cataracts are in their commencement zonular) render this conclusion on the face of it improbable; but the evidence in the case of the lens points to a temporary interference with its growth as the cause of the cataract, and there is such a

close similarity between the lens and the dental enamel in their origin and development that it is natural to expect that they will be affected by the same pathological agents. Both are formed by an involution of the epithelium from the surface of the embryo, and in both the growth proceeds from the deeper layer of this epithelium when separated from the rest of the epiblast by the interposition of a mesoblastic layer. In one respect alone does there seem to be a noteworthy difference between them. The enamel organ has only a brief functional existence. It forms the enamel, and after a few months disappears as a functional organ, but the growth of the lens proceeds during many years, if not during the whole period of life.

A NEW INSTRUMENT FOR FACILITATING RETINOSCOPY.

By Humphry Haines, F.R.C.S., L.R.C.P., Edin.,

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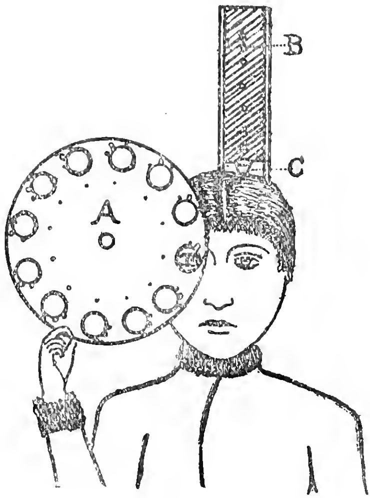
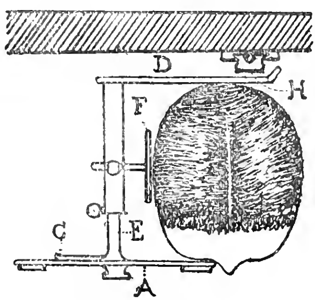
Those who have practised retinoscopy to any extent must have felt the inconvenience and loss of time attending the placing of the various lenses before the patient's eye; this, in the absence of an assistant, necessitating frequent journeys on the operator's part between his place of observation and the patient. In those cases also where the shadow is not distinct, or where it is difficult to decide between two or more glasses as to the correcting one, the time and labour expended become very considerable before the satisfactory completion of a case.

As a means of obviating these drawbacks I have devised an instrument, the general construction of which will be understood by a glance at the accompanying diagrams.



The spring clips on the disc (A) are made to hold the ordinary trial lenses, so that a special set is not required. The vertical adjustment of the instrument is effected by its sliding in the grooved plate (B), a spring catch (C)



As seen from above.

retaining it at the required height. The distance of the disc (A) from the horizontal bar (D) is regulated,

according to the size of the patient's head, by the sliding tube (E). The side head-rest (F) centres the patient's eye behind the lens. A spring catch (G) causes each lens to stop exactly in front of the eye as the disc is rotated.

The rotation of the disc is easily accomplished by the patient, who, in a moment, can place either a higher or lower lens before his eye, so that the effect of each lens can be observed with rapidity by the operator without quitting his place of observation, or even allowing the reflection from his mirror to stray from the patient's eye.

Having completed the examination of one eye the lenses are brought before the other by rotating the instrument on its axis (H), so that the disc passes over the patient's forehead to the other side.

The twelve lenses which the disc holds at one time are almost always sufficient to complete an examination.

The instrument can be had either to fix to a wall or to the back of a chair.

Made by George Prescott, optician, Marrion Row, Dublin; and Lothian Street, Edinburgh. Price, £3; chair adjustment, 10s. extra.

H. Gifford (Omaha). A Contribution to the Study of Sympathetic Ophthalmia. *Archives of Ophth., Sept., 1886, p. 281.*

In a former paper (see O. R., July, 1886, p. 217) Gifford recorded a series of experiments, and some important results arising therefrom, concerning the direction of the lymph-streams in the eye. In the present paper he pursues the same investigation, with special reference to the migration of micro-organisms, and the causation of sympathetic ophthalmia. His results are in the main confirmatory of Deutschmann's discovery that micro-organisms may and do actually travel from an injured eye to its fellow, and in the latter set up inflammatory changes somewhat resembling those which are known clinically as sympathetic ophthalmitis. His conclusions as to the path

taken by the organisms are at variance with those of Deutschmann, and appear to us to have an important bearing on the still open question as to which surgical proceeding, enucleation, evisceration, neurotomy, or neurectomy, affords the greatest security against the invasion of the second eye.

Deutschmann, by injecting into the vitreous of rabbits the ordinary yellow and white pus-cocci, was able in almost every case to obtain well-marked neuro-retinitis in the fellow eye. The time required for its development varied from a few days to three weeks. Typical sympathetic iritis was not produced; the animals died of general infection soon after the neuritis appeared. The micrococci were traced from one eye to the other by way of the optic nerves, their sheaths and the chiasma.

Gifford, repeating these experiments with injections of pure cultures of pathogenic cocci in twenty-one cases, failed to obtain in any single instance a distinct inflammation in the second eye. The inoculated eye underwent severe inflammation, which generally became chronic, and ended in more or less pronounced shrinking of the globe; panophthalmitis occurred in three cases. The lymph-spaces around the central vessels of the optic nerve, and the sheaths and orbital tissues, were all markedly infiltrated with round cells to a short distance behind the globe, but the micrococci themselves were in no case found further back than the bottom of the pit in the disc of the inoculated eye. Pathological changes were not found in the chiasma or the fellow eye, or its nerve, in any case. In two cases only the ophthalmoscope showed a slight but undoubted hyperæmia of the disc in the fellow eye, which passed away in a few days, leaving no microscopic abnormity.

Having, as described in his former paper, witnessed the much freer migration of inorganic particles, Gifford concluded that the arrest of the micrococci in the injected eye was probably due to the choking of the lymph-vessels with leucocytes, resulting from an excessive degree of irritation; he therefore looked about for an organism which would excite a less violent reaction. Such an organism he found in the bacillus of anthrax or splenic fever, the use of which was suggested to him by Professor Klebs, of Zürich. This bacillus he succeeded in tracing from the vitreous of one eye around into the peri-choroidal space of the other. The migration

was, however, completed in only three out of twenty-five cases, for when, as often happened, the conjunctival tissue was accidentally inoculated, death by general infection followed very rapidly.

He concludes from these successful experiments that, under proper conditions, in rabbits, micro-organisms may be carried by the lymph-streams from the vitreous of the one eye to the space around the choroid in the other, and that the path taken is the same as that which was previously observed by him in the case of amorphous powders, viz., from the vitreous along the sheaths of the central vessels out into the orbit; thence, outside the nerve, to the cranial cavity; thence, down between the optic sheaths, to the second eye. The exact passage from the first orbit to the cranium cannot yet be stated. Seeing that in animals differing so much as rabbits and cats this migration of particles has been demonstrated, and that the structure of the parts in man is not essentially different, it may be provisionally assumed that the same thing can occur in man also, and is actually the mode by which sympathetic ophthalmia is produced.

Why are there no cranial or orbital symptoms in sympathetic ophthalmia if the micro-organisms pass through these cavities on their way to the second eye? Gifford replies, as Deutschmann previously did, that there undoubtedly is a slight lymphangitis in the orbit, and a meningitis at the anterior part of the base of the brain, but that the lymph-stream generally prevents the micro-organisms from collecting in sufficient numbers to do serious mischief at these points. It is well established in general surgery that pathogenic bacteria do serious mischief only where, from anatomical or other conditions, they collect in considerable quantities: they pass from one part to another, producing only a slight lymphangitis on the way, and cause no severe inflammation until they accumulate, as for instance in the lymphatic-glands. From an infected human eye they are probably carried along through the orbit by the lymph-stream and on reaching the cranial cavity are met by the current which sweeps down into the intervaginal and supra-choroidal spaces, their main effect being produced where they collect at the anterior part of the uveal tract. That the lymph-current is sometimes insufficient to guard the meninges from

serious trouble is shown by the fatal cases occurring after orbital-cellulitis, enucleation, and even suppurative iritis following discission.

The fact that, at least in the rabbits employed by Gifford, the posterior lymph-channels were quickly closed against the passage of micrococci helps to explain, he thinks, the non-occurrence of sympathetic trouble in many cases where we might expect it, especially where the primary inflammation is violent. In opposition to Leber and Deutschmann, who would explain this immunity by a supposed destruction of the organisms in cases of violent suppuration, or by their evacuation through bursting of the eye, Gifford states that in corresponding cases in rabbits he has found micrococci perfectly capable of development. He has little doubt that in man as in rabbits the lymph-channels become blocked when the inflammation reaches a certain height, though unfortunately the emigration of leucocytes appears to be less active in us than rabbits, hence our greater proclivity to sympathetic inflammation.

With regard to those cases, doubted by some authorities, in which sympathetic ophthalmitis occurs many years after the injury, Gifford urges that in general surgery it is established that foreign bodies after resting quiet in the body for years may become the centres of an undoubtedly infectious inflammation.

The difference between Gifford's results and Deutschmann's, apart from the greater difficulty of obtaining the infection of the second eye, lies in the path along which the organisms appeared to travel. Gifford finds without doubt that they pass to the brain not within the sheaths of the optic nerve, against the lymph-stream there existing, as Deutschmann supposed, but that they pass out of the nerve with its central vessels and thence backwards through the orbit outside the sheaths of the nerve.

Those surgeons who advance *a priori* arguments as to the superior safety which they obtain by evisceration as compared with excision must, we think, take Gifford's demonstration into account, for it would now appear that division of the optic nerve is not particularly likely to promote the passage of micro-organisms into the cranial cavity. Again, it would appear that if the optic nerve sheaths do not convey the organisms

to the brain the operation of optico-ciliary neurotomy, or even neurectomy, can do little or nothing to diminish the chances of sympathetic disease.

Gifford's demonstration of the primary importance of the perivascular lymph-spaces as migration channels lends some support to the view advanced by Mules (*vide* O. R. Vol. III., p. 306), that while micro-organisms are the essential cause of the inflammation in the second eye, their access to it depends upon dilatation of the lymph-passages, which may be a result of reflex neurosis.

EMILE MARTIN (Marseilles). **Sight to the Blind by means of an Artificial Cornea.** *Paris : Baillière et Fils*, 1886.

The author describes a novel proceeding, the outcome of a series of experiments, by which he confidently hopes to realise the object indicated in the somewhat sensational title of this pamphlet.

For cases of blindness in which, in spite of disorganisation in the front of the eye, the retina and optic nerve remain comparatively healthly, relief has several times been attempted by some proceeding which should re-admit the light to the interior of the eye. Thus Nussbaum proposed to incise the leucomatous cornea and to insert in the aperture a small button of glass grooved around its edge.* Martin, in his first effort in the same direction, attempted to improve upon Nussbaum's idea by drawing a fold of conjunctiva over the inserted piece of glass, intending later on to make a small aperture in the membrane over the centre of the glass. He describes in detail a case in which he made such an attempt, employing a slip of conjunctiva from a rabbit as a graft. The immediate result of introducing the glass into the opaque tissues was to restore vision to the patient, but on the second day both the conjunctival graft and the artificial cornea were cast off and the operation was a failure.

The attempts to replace an opaque cornea by engrafting a transparent one from the eye of an animal, made at various times by Reissinger, Walther, Dieffenbach, Desmarres, Power,

* München and Deutsche. Klinik, No. 34, 1853.

and von Hippel, afforded no encouragement for further experiments in that direction ; the outcome of such attempts appears to be that the graft usually perishes, and that in the rarer cases in which it unites and lives, it becomes as opaque as the tissue which it is intended to replace.

Rejecting therefore the idea of re-opening a path for the light through the disorganised tissues occupying the front of the eye-ball, Martin proposed to himself a different method which appeared to have less formidable difficulties to meet, namely, to give to the eye a permanent rotation of forty or forty-five degrees, inwards or outwards, so as to bring the sclera towards the front, and to introduce through the sclera behind the ciliary region a small tube of gold into which fits a plug of crystal (? glass). The apparatus, which after several modifications he now recommends, consists of two separate parts. The first is the crystal cornea, which has the form of a truncated cone, and fits like a stopper into the tube ; it is 2 mm. in length and 1 mm. broad at its larger end. The second is the frame or tube of gold, which resembles a small cylindrical canula with fenestrated walls ; it is 1 cm. in length and is adapted to a needle or trochar, by means of which it is passed through the tunics of the eye. When the needle is withdrawn the tube remains in place. The considerable length of the tube is found necessary in order to give to it a sufficient degree of fixity and to prevent its being extruded by pressure from within. When introduced experimentally into an enucleated eye it was found to retain its position in spite of external pressure upon the globe, and to give exit to no vitreous substance when the latter was of normal consistency. It meets, according to the author, all the requirements of the case ; its introduction is easy, it is covered and protected when first introduced by conjunctiva, it is made of a substance which undergoes no change even after long sojourn in the eye, it is not fragile, it has no tendency to be driven out of the eye, it does not permit the escape of a notable quantity of the vitreous, it gives passage nevertheless to sufficient light and creates a visual field sufficiently large for orientation.

In the first experiments the operation was divided into two parts separated by a long interval of time. First a deviation inwards or outwards was obtained, by division of one muscle

combined with the advancement of the antagonist. One or two months later the tube was inserted. This method of proceeding had disadvantages; the delay was inconvenient and at the second operation the cicatrix in the conjunctiva rendered the second dissection and the covering of the canula difficult. Martin describes his present method of operation as follows:— "I practise the advancement of the one muscle and strabotomy; I immediately lay bare the sclera at the point of election; I introduce the canula by a simple puncture and I cover it with conjunctiva drawn over it by means of a single suture. After washing the eye with an antiseptic I apply a dressing which remains in place forty-eight hours, after which the suture is removed and it is only necessary to continue the bandage a few days longer. The operation is not followed by any reaction. When the conjunctiva has recovered its normal aspect and the eye is accustomed to the apparatus, it remains only to introduce the crystal cornea into its frame. With a fine galvano-cautery I destroy the conjunctival tissue which covers the orifice of the canula and then introduce through it a slender style to the depth of 1 cm.; moving this gently backwards and forwards I free the interior from any foreign substance which may obstruct it. The crystal stopper held in an instrument like a porte-crayon is then introduced into the orifice by its thinner end and entered up to its base. It is then definitely fixed." (How it is fixed the author does not state.) Some rather vague details of eight cases are given.

1. A man aged 29, blind since 10 years old; right eye entirely destroyed; left, cornea opaque and flattened, anterior chamber destroyed, retained perception of day-light and of the light of lamp at two metres. This was the first case experimented on and the apparatus was defective. The author had already ascertained that small canulas of gold are well tolerated in the eyes of animals; he desired to ascertain whether such a canula in the human eye would actually admit the light in useful amount. He introduced the tube and found that the patient could readily count candles 1, 2, or 3. The test was repeated several times and always satisfactorily; three days later the eye was re-established, "l'œil était rétabli." (We presume this means that the canula was at once withdrawn, and that three days later the eye had recovered from the operation.)

2. A man, aged 70, blinded by a severe ophthalmia. Right eye shrunken; left, form preserved but cornea replaced by cicatrix; suppurative conjunctivitis; perceives light of lamp at two metres. After treatment of the conjunctivitis, tenotomy and advancement of the antagonist were performed, resulting in a deviation of thirty degrees. Fifteen days later the canula introduced, no reaction; it could not be covered by conjunctiva, but nevertheless did not hinder the movements of the eye. After ten days more the canula was freed from secretion, and vision was tested; candles could be counted and a hand distinguished at eighty C.M. Fifteen days later the crystal stopper was introduced without difficulty, the patient wore the apparatus seventy-five days (the time which had elapsed at the date of writing?) Vision was as good as could be hoped for, and throughout the whole time there was not the slightest re-action.

3. A woman, aged 27, blind since infancy. Right eye atrophied; left, large corneo-scleral staphyloma projecting between the lids; frequent pain and inflammation; nystagmus; lamp-light perceived at 2.5 metres; tenotomy and advancement were performed, bringing the staphyloma towards the inner angle and thereby enabling the patient to close her eyelids; no inflammation followed. Three weeks later the canula introduced and easily covered by conjunctiva; no pain; no re-action. To test the endurance of the eye it was removed on the tenth day, and again introduced three days later. This was effected as easily as at first and caused no important inflammation, but it proved more difficult to cover the instrument with conjunctiva. "At the end of fifteen days I finally removed the instrument, after having obtained a considerable amelioration of vision." (Why the removal?)

4. Right eye, enormous staphyloma; left, staphylomatous in lesser degree, perceives light. Artificial cornea introduced and left in the eye forty days without pain or accident of any kind. Whether then removed or permanently retained, and whether with benefit or not, is not stated.

5. A woman, aged 35, left eye atrophied; right of normal volume, anterior chamber abolished, iris adherent to sclerosed cornea, tension diminished, feeble perception of light towards

the left ; probably a large detachment of retina. Displacement of eye and introduction of artificial cornea, performed at one sitting. At the time of writing, seventy hours after the operation, the eye was but little injected, and the artificial cornea was clearly visible beneath the conjunctiva which had been drawn over it. The patient distinguished the flame of a candle placed at her left. She remained under observation.

6 and 7. Two cases, related from memory, of adherent leucoma. "The results were perfect. . . . . The operation practised at a single sitting was not followed by any complication."

8. A man, aged 25. Blind from infancy, the right eye being shrunken, the left preserving perception of light. Tenotomy and advancement were performed by Dufour of Lausanne as a preliminary to the introduction of the artificial cornea. Two months later he came under Martin's care. The light of a lamp was perceived at five metres, the direction of its movement at about one metre. The details of the case are given in the patient's own words. "For five weeks I have felt no pain and there has been no inflammation. I have neither headache nor sensitiveness of the eye, and if I did not know that an instrument had been introduced, nothing could make me believe it. . . . . . The first trial of vision was made to-day, and is very satisfactory to me. I understand now the meaning of the words *field of vision*, and I can say that my field is increased. I know the difference between white and deep colours, and even in the day-light, from the window facing which I am placed, I can distinguish in succession the flames of candles placed at different sides of the apartment. . . . . . Dr. Martin passes his hand before my eye and I distinguish the cuff of his shirt, easily recognisable by its brightness. I have then a very real amelioration. . . . . . I have had the satisfaction of experiencing visual sensations which were completely unknown to me, and I cherish the hope of soon conducting myself without the help of a guide."

The author points out that his experiments, being guided by prudence, have been made hitherto upon eyes so far disorganised that a good visual result was impossible. Having

now convinced himself that the operation is harmless, he feels justified in recommending it to others, and in advising its application in nearly all cases of blindness in which the retina and optic nerve are healthy.

He anticipates, moreover, that the canula which he has devised for the purpose of admitting light may also be turned to good account as a drainage tube, in such cases as those of detached retina, progressive staphyloma, and long-standing painful glaucoma.

L. Webster Fox and George Gould. On Heat considered as the Retinal Intermediate of Light and Colour Sensation. *American Journal of Ophthalmology, July*, 1886.

The authors of this paper apparently entertain the view that the minute differences which are distinguishable qualitatively as differently coloured light, and quantitatively as light of varying degrees of intensity, are but the consequence of the appreciation, so to speak, by the retina in the first place, of so many different degrees of temperature in the different light rays which impinge on it, while the corresponding molecular movements of the retina are transmitted to the brain, where alone the consciousness of these differences arises. In support of this view, which they dignify by the name of a theory, and which is in the main, in so far at least as it contains any sense at all, similar to that which many others have previously advanced, they adduce no experimental proof but content themselves with speculation. Now what we do know is that the usual physical conditions which give rise to light sensations are similar to, and only differ in degree from those which awaken in us the consciousness of what we call heat. But inasmuch as the sensation in the one case is light and in the other heat, what is gained by saying that the appreciable differences in quantity and quality of light are but appreciable differences in the temperature of those rays which elicit the sensation of light? This is, as it seems to us, only a clumsy and illogical way of expressing that the molecular response in the retina to the external vibrations is similar to though perhaps more delicate

than that which takes place in the end-organs of the temperature sense; that is to say, that the first transformation of the energy of the light waves is mechanical and not chemical. But where is there any proof of this? The analogy exists only in the physical and not in the physiological and psychical aspect of the two cases. The temperature sense is only quantitative and produced always by the same physical conditions. The sense of light on the other hand is qualitative as well as quantitative, and may be the result of many different physical causes. It seems hardly necessary to take so much trouble as the authors do to point out that it is in the brain and not in the retina that the sensation of light and colour is evolved. No one doubts this nor has anyone doubted it ever since experimental physiology took the place of metaphysical speculation. The main difficulty has all along been how to explain the manner in which the transformation of energy of one known form takes place in the retina into that of another known form, with the result that so many different degrees in the quality and quantity of the objective stimulus excite in the brain through the intervention of the second form of energy a corresponding variety of different impressions. The hypotheses of Young and of Hering, which are based on the doctrine of specific energies, may be wrong and in all probability are wrong, but they are an attempt at all events to explain this, the main difficulty, and which the "theory" under consideration passes by as if it did not exist. Here is the theory as summed up in the words of the authors themselves and expressed in less unintelligible language than that which records the data from which their conclusions are drawn :—

"The retinal end-organs are not essentially different in function from those of the nerve end-organs of the temperature in other parts of the body, only more refined, more exposed, more percipient of the exquisiteness of change. The pigmentary layer is the seat of the molecules, suspended in delicate poise of unstable equilibrium, whose function it is to respond sympathetically to the impinging ether waves, and whose answering vibratory activity is perceived by the rod-tips as the achromatic stimulation of white, or common daylight; and by the more delicately pointed and retracted cone-tips as those finer gradations of vibrational frequency, finally resulting in the

cerebral product denominated color. The optic nerve tremors or transmissions are not unlike those of other nerve systems which transmit delicate differences and amplitudes of stimulus, and from which raw material the cerebral artificer fashions the marvellous products, light and colour, with infinite cunning and by inscrutable methods."

From this it would appear that the authors look upon the transformation of the vibrations of ether into light sensations as something analogous to the change of sound waves into periodic variations of electric potential, and their subsequent re-transformation at a distance that takes place in telephony. Yet even were the nerve energy, which is known to be transmitted at an enormously much slower rate than are light vibrations, capable of being influenced by comparatively slight changes in the rapidity and amplitude of these light vibrations, and thus capable of setting up similar molecular changes in the brain as those which the objective stimulus arouses in the retina, it is still obviously much simpler to imagine, apart altogether from experiments such as for instance those recent ones of Charpentier, that the brain might be capable of appreciating differences in the proportional stimulations of two such end-organs as the retinal pigment and cones, which might well be brought about by differences in the objective cause and of elaborating out of the consciousness of these proportional stimulations the impressions which we call colour. In short, we must have experimental results and not mere speculations before us before we can give up the idea of specific energies, be it in the hypothetical form of the tripartite fibres of Young and Helmholtz or in any other form which may appear more consistent with the known anatomy and physiology of the retina. The authors conclude their *résumé* with the following remarks :—

"To be acceptable to the cultivated inductive mind of this age, a theory must not contradict the evident laws of physics ; it must not contradict the evident facts which it is seeking to explain ; it must explain the unknown by analogy with the laws of the known ; it must have the crowning merit of unity or simplicity, whence multiplicity of result proceeds logically from singleness of cause ; it must, lastly, more properly localise is the mystery yet remaining, and say 'Here is light, there it

not.' We modestly submit that previous theories, with the notable exception of that of our leader, Wundt, do not answer to these demands of the scientific spirit, and that our own, in a more or less perfect manner, does do so."

We should expect then to find the evident laws of physics clearly and accurately stated in the paper. Here is a specimen of the authors' physics :—

"That the ultra-red waves have no effect upon the receiving body of the retina arises from several reasons ; such rays are more varyingly and more wholly absorbed by the ever-present dust-clouds of the air, as also by all terrestrial bodies, before the reflected rays reach the eye ; they are two powerful producers of molecular activity ; they would too strongly upset the delicate equilibrium of the retinal temperature. Lastly, they are too irrefrangible to be bent by the weak ocular media; their inclusion with the other rays would lead to pronounced circles of diffusion. The ultra-violet rays are shut out for similar reasons : their great dispersion through their high refrangibility, by the two powerful atmospheres of the sun and the earth because of their weak kinetic energies ; because of their too easy refrangibility by the media of the eye."

The suggestion is thrown out that the great vascularity of the choroid corresponds "to the need for that high and uniform temperature which would be demanded both for a registration of slight thermal differences and a re-instatement of the normal after each disturbance or stimulation," and it is believed that "the periphery of the retina perceives colours less easily than the centre may be due to its more exposed and less blanketed condition. Its subnormal temperature results in decreased sensitiveness."

For this there is not only speculation, for we read :—

"To prove this the authors have applied a pencil of ice to the exposed sclerotic of the converged eye and then thrown coloured images obliquely upon the cooled retina. Under the influence of cold a brilliant colour can quickly be reduced to black, and as quickly brought back to its normal by the removal of the ice, or more speedily by the application of a heated sponge in place of the same." Should this experiment be confirmed it would obviously merely confirm what we believe already, that the retina is dependent in a high degree on its

vascularity for the evolution of its functions; not, however, that its function consists in discriminating between slight temperature changes.

Some pages containing a statement of actual physical and physiological facts which have long been known do occur in the paper before us, but it must be left to the reader who cares to wade through these to discover in how far they have any direct bearing on the authors' theory, or whether they might not just as well be used as arguments in favour of any of the necessarily elastic, but more advanced and rational hypotheses, which may be looked upon as first approximations towards an explanation of light and colour perception. B.

GRIFFITH (Manchester). Syphilitic Lesions of the Eyelids. *Med. Chronicle, June,* 1886.

DE BECK (Ohio). Hard Chancre of the Eyelids and Conjunctiva. Inaugural Dissertation. *Robert Clarke and Co., Cincinnati,* 1886.

Griffith records twenty-one cases of ulceration of the eyelids, including primary chancres, ulcers occurring in the secondary and tertiary stages, and other lesions which in their appearance closely resembled primary chancres, but were not accompanied by undoubted symptoms of syphilis.

Nine of these were, he believes, examples of the primary manifestation of syphilis, being followed in every case by a characteristic eruption, except in one case which was lost sight of before the date for the eruption. These nine cases include probably all that came to the Manchester Eye Hospital during the last four years. Induration at the seat of ulceration was a marked feature in these cases, while in four cases of ulceration occurring during the secondary and tertiary stages, induration was conspicuous by its absence. On the other hand, however, Griffith notes that the most marked induration he has ever seen was in the case of a young man aged twenty-two, who had an ulcer of the upper lid which was thought specific, but proved to be a rodent ulcer.

The glands were hard and enlarged in all the nine cases of primary sore.

The site of the lesion was near the edge of the upper or lower lid, invading the mucous membrane to some extent. In

one case the chancre was situated on the inner surface of the upper lid well back from the free edge, resembling the cases recorded by Nettleship and Wherry (Oph. Soc. Trans., 1882).

A table is given of all the cases, stating the position and appearance of the local lesion, which is figured in several of the cases, the state of the præauricular glands, the nature of the skin eruptions when present, and also the further progress and treatment of the cases. In only one case does there seem to have been any extensive destruction of the lid.

De Beck records a case of primary hard chancre of the lid. He also gives a coloured drawing of his own and of three other cases, and he has collected from numerous sources the details of ninety-four cases, some of them not yet published. The dissertation is in fact a complete monograph on the subject, with a full bibliography. Various points of interest come out in the inquiry. He finds it much more common in France and the south of Europe than in other countries, fifty-five of the cases having occurred there. The principal means of infection are the unclean finger and the diseased mouth. This latter is specially to blame in the case of children who are kissed so indiscriminately by all. The uncleanly habit of using the tongue to remove foreign bodies from the eyeball and conjunctival cul-de-sac has been responsible for several cases. He records also several cases of accidental infection in medical men, explained in most cases by pre-existent palpebral or conjunctival disease.

The lesion commences as a pimple, not painful, but ulcerating on the summit, becoming indurated and finally affecting the præauricular and submaxillary glands. The course of the ulcer is chronic and indolent, but the prognosis is quite favourable as far as the eye and its associate parts are concerned.

The treatment by the local application of mercury in various forms has succeeded admirably. Cauterisation is probably of no use and may do much harm.

HIRSCHBERG (Berlin). On the Coloured Rings in Glaucoma. *Deutsche Med. Wochenshrift*, 1886, *Nos.* 3 *and* 4.

Having referred to the early work of v. Graefe and Donders on the subject, Hirschberg states that he agrees with the belief

that the "rainbows" or coloured rings of glaucoma are due to diffraction by the cloudy cornea. This he does (1) because of the spectroscopic arrangement of the colours, (2) because occasionally a double spectrum is seen, and (3) because the innermost blue zone, which is usually dark and is overlooked by the patient, becomes extremely prominent in the electric light, which is richer in refrangible rays than gas-light. When a naked gas or candle light is observed by a glaucomatous patient at the distance of a few feet, he sees round the flame a broad dark zone, round this a second concentric coloured ring about the same breadth the inner part of the ring being green, the outer red. Occasionally, and this specially with the electric light, at the outer part of the broad dark zone is seen a blue zone lying internal to the green zone, and passing through bluish green and bright green into brownish red. When a second rainbow is seen outside the other the colours are paler but arranged in the same order, green internally, red externally. This differs, therefore, from the true double rainbow, in which the main rainbow has violet internally, red externally, while the second rainbow is arranged in the opposite order. Hirschberg records a case of glaucoma simplex in which rainbows were seen, although careful examination failed to show the least corneal cloudiness. In this case the rainbows. which came and went, were definitely associated with nervous excitement. It is undoubtedly a highly hereditary symptom. Hirschberg cites the case of a girl, aged 14 years, who for two years had had "rainbows." Her father had been similarly affected and at the age of 56 had iridectomy for glaucoma simplex. His mother died at the age of 80 with good vision, although she uniformly saw haloes round naked lights. Rainbows may even be seen by healthy eyes, especially if the pupils are wide, and the conjunctiva for any reason highly congested, as after a vapour bath.

In ordinary inflammatory glaucoma the corneal reflex is irregular, with fine iridescent fringes. Fraunhofer has shown that similar coloured rings are produced by looking at a flame through a plate covered with lycopodium powder. Accordingly, as might be expected, rainbows are observed in corneal cloudiness due to other causes than glaucoma—for example, in keratitis punctata, also in early cataract and in conjunctivitis. Hirschberg discusses at considerable length the coloured rings seen in

the last affection, and gives several figures drawn for him by patients. As points of differential diagnosis between the coloured rings of glaucoma and those of conjunctivitis, he notes in the first place that the great proportion of persons suffering from conjunctivitis do not complain of the colours, either not observing them or recognising the cause in the fluid covering the cornea which contains numerous diffracting particles. And in the second place those who do observe them generally state that the candle is surrounded by a yellow zone with numerous rays, and, around this, coloured zones in order, red, blue, green, red, differing therefore from the rings in glaucoma.

UHTHOFF (Berlin). On a Case of Neuritis of the Right Trigeminal Nerve (first and second branches), with Affection of the Lachrymal Nerve and Unilateral Cessation of Lachrymal Secretion. *Deutsch. Med. Wochenschrift, May 13th, 1886, No. 19.*

The patient, Mrs. M., aged 27 years, an anæmic feeble-looking woman, had suffered four years before from abdominal inflammation, two years before from acute rheumatism, and as a girl she frequently had convulsive sobbing attacks (?) Married several years, no children, never pregnant, denied syphilis. No clue to family history. In August, 1885, the patient was seized with severe pain in the right cheek in the area of the infraorbital nerve. She attributed the pain to a decayed right upper incisor, and had it extracted. On her return home the pain set in with such severity, especially in the right temple, that she began to cry, when her sister remarked that she wept with the left eye only. This had certainly not been the case before. Next day there was severe deep-seated pain in the right eye-ball, for which she was treated with potass. bromid. and ung. bellad. After a few days the pain ceased somewhat suddenly, but the right eye continued to be uneasy, sensitive to draughts, and feeling as if it were too large for the orbit. Objectively the eye seemed normal, but there was marked anæsthesia in the distribution of the superior maxillary nerve, the right cheek, upper lip, and hard palate, as also in the eye itself and its conjunctiva. The infra-orbital nerve at its exit from the foramen was very sensitive to

pressure. There was no special dryness of the conjunctiva observable, but of the absence of lachrymal secretion there could be no doubt. When she smelt an onion, as Uhthoff demonstrated, the tears flowed over the left cheek, while the right showed no increase of secretion, and the same was the case when she wept from emotional causes. When shown, the patient had lost the sensory disturbance of the fifth nerve, except that latterly she had had an attack of neuralgia in the first division.

Uhthoff considers this a case of ascending neuritis in the superior maxillary division of the fifth nerve, perhaps starting from the decayed upper incisor, the inflammation extending later to the ciliary and lachrymal nerves and other branches of the first division. He justifies his diagnosis by the erratic nature of the process, by the sensitiveness of the infraorbital nerve, and the regression of the sensory disturbance. The cessation of reflex lachrymation he attributes to involvement of the lachrymal nerve, whether its sympathetic fibres or special secretory fibres contained in it. The persistence of the cessation after other symptoms had subsided is, Uhthoff considers, unique.

C. F. Pollock (Glasgow). The Normal and Pathological Histology of the Human Eye and Eyelids. *London: Churchill,* 1886.

This attractive hand-book consists firstly of about 160 pages giving a concise account of the normal and pathological histology of the eye and eyelids; and following this of 100 lithographic plates, comprising altogether 230 original microscopic drawings; a description of each drawing, with notes, when necessary, of the case from which it was taken, stands facing it on the adjoining page. The drawings constitute the chief excellence of the book; they are done by a skilful hand, and will be recognised as unusually faithful by those who use the microscope. They are, the author tells us, the result of several years' continuous work, and were taken from preparations selected as typical and instructive without modification or alteration of any kind.

The systematic treatise which forms the first part of the volume is good as far as it goes, but has, we fancy, been less a

labour of love to the author than the artistic portion. We hope he will develop it more fully, especially in the way of connecting the appearances which he draws so well with the processes which give rise to them. Thus the pathological histology of hard cataract is dismissed in five and a half lines, and that of anterior polar cataract fares little better; in neither case do we get a hint of the nature of the pathological process by which the visible changes are induced—a remarkable shortcoming at the present day, when Becker has lately given us a large volume on the lens alone. (*Vide* O. R., Vol. II.)

In the description of the structure of the iris we read "immediately in front of the uvea there is a continuous delicate sheet of nearly straight and almost parallel radiating fibres, which are composed of involuntary or unstriped muscular fibre-cells with their usual elongated nuclei." This statement is in direct opposition to the most recent researches (*Vide* Fuchs, O. R., Vol. V., p. 15.) Among a series of drawings showing changes in the ciliary region in glaucoma we find representations only of the advanced and atrophic stage, in which the ciliary processes and muscle are greatly wasted; it would be well to show also the changes which constitute the earlier stages of the disease. In this connection we may note that in this book, as well as in some other recent writings, the angle of the anterior chamber is spoken of as the *iritic* angle; if a short name is wanted, should it not be iris-angle, or *iridic* angle? Iritic, of course, can be derived only from iritis.

In spite of some incompleteness, not unnatural in a laborious and difficult undertaking of this kind, the book is a most welcome addition to our special literature and supplies a real want.

G. F. Helm. Short Sight, Long Sight, and Astigmatism; an Elementary Guide to the Refraction of the Eye. *London: Churchill*, 1886.

The author says that the object of his book is to place before students and practitioners an elementary treatise on the errors of refraction of the eye, and to explain in simple language their nature and the means whereby they may be satisfactorily

corrected, and thus to provide an introduction to the more advanced manuals on the same subject.

We regret to have to say that we can find nothing to commend in this publication. Students and practitioners who have not the time or the energy to study "Donders" can find well-written chapters on the subject in almost all the recent handbooks on diseases of the eye, and from them will get much better teaching than from such a book as this. We speak plainly because we think that loose writing on important scientific subjects ought to be discouraged in the interest of the readers for whom it is issued.

Chapter I., headed *Light*, opens with the statement that rays of light proceeding from an object which is situated at a distance of six metres or more from the observer "are considered as proceeding from that object in parallel lines, and therefore they fall upon the eye of the observer as parallel rays of light." Of course the meaning is that, of the rays which diverge from the point in question, those which enter the eye diverge so slightly that they may be regarded as parallel; as it stands, the sentence is truly bewildering. A little further on we are told that "rays of light passing through a spherical lens or prism are always refracted towards the thickest part of the lens or prism," and for further enlightenment we have a figure in which the rays are represented as not passing through the lens at all. In order to "simplify future explanations" we are asked to "regard the myopic eye as one which errs in having its refractive media too convex," but we are not told anything of the actual cause of ordinary myopia, of the mode of its production, of any precautions which its presence calls for in addition to the use of glasses, of its relation to insufficient convergence, or of the use of prisms. Neither in connection with hypermetropia nor elsewhere, so far as we can see, is strabismus mentioned. In the chapter on acuteness of vision we learn that the standard of normal vision which is generally accepted is "that a normal eye should see clearly any object which subtends an angle of five minutes, *i.e.*, which subtends the visual angle." Throughout the whole book circles are employed to represent the contour of ametropic as well as of emmetropic eyes, and this, besides being sure to mislead the student as to the essential nature of the ordinary forms of hypermetropia and

myopia, has apparently misled the author himself; for at page 57, in accordance with the faulty diagram, he states that the nodal point is nearer to the cornea in myopia, and further from it in hypermetropia, than in emmetropia. Further on we are told that "it will help us towards gathering a good idea of the different forms of astigmatism if we take it as a fact (*a*) that the vertical meridian of the cornea is naturally more convex than is the horizontal meridan, and therefore (*b*) in all the forms of astigmatism the focus of those rays which are refracted by the vertical meridian is always more anterior (*i.e.*, nearer to the cornea) than is the focus of those rays which are refracted by the horizontal meridian." It is only fair to say that this statement is contradicted on the next page. It is certainly not helpful in connection with any kind of learning to acquire false ideas as an introduction to true ones, yet this is the mode of progression offered to those who read primers like the one before us.

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NOTE ON THE RELATIVE VISUAL ACUITY OF FULLY CORRECTED AXIAL AMETROPIA.

By George A. Berry,

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If the glass correcting an axial myopia or hypermetropia be situated at the anterior focus of the eye, the images which such an eye receives of distant objects are of the same size as those formed on the retina of an otherwise similar emmetropic eye.

Although, therefore, under such circumstances they start equal, the visual acuity of a fully corrected axial myopia or hypermetropia when accommodated for a definite distance is not exactly the same as that of a similarly refracting emmetropic eye accommodated for the same distance.

The difference is slight and of no practical importance, though interesting from a theoretical point of view.

It seems improbable that this difference in relative visual acuity should have altogether escaped notice, so that if I am right in believing that it is not discussed in the standard works on refraction, this is no doubt owing to the subject not having been deemed of sufficient importance. The works I have consulted are those of Donders and Mauthner, and the more recent treatises of Nagel and Landolt, the former of which contains a very full discussion of the influence of spherical lenses on the size of the retinal images.

Before determining the expression for the relative acuity in corrected ametropia it is necessary to refer to the change that a spherical lens produces on the

amplitude of accommodation. In accordance with the notation now most frequently adopted, we may write A for the amplitude of accommodation, *i.e.* for the dioptric value, according to the metrical notation of the addition to the refractive power of the eye by which it is adapted for the vision of the nearest object of which it is capable of obtaining a clear image. Strictly speaking, of course, the actual accommodative change takes place somewhere between the first principal and first nodal points of the eye, but no great error is introduced and the calculation much simplified by looking upon this change as equivalent to the power of a lens (whose thickness may be neglected) situated in the first principal plane. A, then, is taken equal to the dioptre lens, which in this situation would change the focus of the eye from that adapted for its far point to that adapted for its near point.

This is generally expressed by the formula:

$$N - F = A$$

where $N = 1$ metre divided by the distance from the near point to the first principal point, and $F = 1$ metre divided by the distance from the far point to the first principal point. Now if we put L for the value in dioptres of an imaginary lens in the first principal plane we have the far point before and after the addition of such a lens conjugate foci to it, and, therefore, adopting the same metrical notation:

$$F' - F = L \qquad a.)$$

Inasmuch, however, as it is impossible to place any actual lens in this position we may call the value of the lens in front of the eye which produces the same dioptric change, the strength of which is greater in the case of a negative and less in the case of a positive lens if used for the correction of myopia and hypermetropia respectively, L′.

The distances of the near point from the position occupied by this lens before and after it is placed in

front of the eye are conjugate distances with respect to it, so that putting the value in dioptres of these distances equal to X and X′ respectively we have:

$$X' - X \quad L' \qquad\qquad \beta.)$$

Subtracting α) from β.) :

$$X' - F' = X - F + L' - L$$

Putting then N and N′ for the value in dioptres of the distances of the near point from the first principal point of the eye, before and after refraction through L′ :

$$X' - F' = N' - F' + X' - N' = A' + X' - N'$$

and

$$X - F = N - F + X - N = A + X - N$$

therefore,

$$A' = A + (L' - L) + (X - X') + (N' - N)$$

and as $X - X' = \; - L'$

we have finally for the value of the new amplitude of accommodation

$$A' = A + (N' - N) - L.$$

When L′ fully corrects the ametropia $L = F$

$$\therefore A' = N'$$

L is always greater than $N' - N$; when L therefore is negative A′ is greater than A ; when positive, A′ is less than A.

Therefore in the case of corrected myopia the amplitude of accommodation is greater, in that of corrected hypermetropia it is less than in emmetropia.

The acuteness of vision is determined by the smallest visual angle which admits of a sufficient separation on the retina of the images of two objects, to allow of their being distinguished as discrete objects.

Any circumstance which increases the distance from the second nodal point to the retina will therefore admit of the minimum visual angle being diminished, and therefore increase the visual acuity.

On the other hand, a diminution in the distance separating the retina and second nodal point must give rise to a diminution of the visual acuity. If we consider as the unit of visual acuity that possessed by the normal emmetropic eye of the average type when at rest, and therefore accurately focused for the vision of distant objects, we may calculate the change that takes place in acuity, or in other words the relative acuity, in the following way:—When not accommodated the second principal focus of the eye lies on the retina, and the distance between it and the second nodal point equals the anterior focal distance of the eye $=\phi$. According to Helmholtz the average value of ϕ is 15·498 mm. When the eye is accommodated its principal focus no longer lies on the retina, whilst the value of the anterior focal distance is also changed. We may denote the new value by $\phi_{,}$ and the new value of ϕ' the second focal distance, by $\phi_{,}'$. The distance from the second nodal point to the retina is then in the accommodated eye $\phi_{,}$ + the distance between the second principal focus and the retina or

$$\phi_{,} + v - \phi_{,}'$$

as the distance from the second principal point of the accommodated eye to the retina is conjugate to the distance from the first principal point to the object for which the eye is accommodated. We have, therefore, in accordance with a fundamental formula in geometrical optics

$$v - \phi_{,}' = \frac{\phi_{,}\ \phi_{,}'}{u - \phi_{,}}$$

The visual acuity on accommodation, or the relative acuity (V′) is to the acuity of the eye at rest, or the absolute acuity (V) as

$$\phi_{,} + \frac{\phi_{,}\ \phi_{,}'}{u - \phi_{,}} \ : \ \phi$$

$\phi_{,}$ is found from Helmholtz, formula for the value of the anterior focal distance of a system which is a combination of two systems, the focal distances of each of which is known,* viz.:

$$\phi_{,} = \frac{\phi\ f}{\phi + f - D}$$

As f represents the focal distance of the lens required in the first principal plane to accommodate the eye for the distance u we may put in this expression $f = u$ and $D = o$; then

$$\phi_{,} = \frac{\phi\ u}{\phi + u}$$

and

$$\frac{\phi_{,}\ \phi_{,}'}{u - \phi_{,}} = \frac{\dfrac{\phi\ \phi'\ u^2}{(\phi + u)^2}}{u - \dfrac{\phi\ u}{\phi + u}} = \frac{\phi\ \phi'}{\phi + u}$$

$$\therefore \quad \phi_{,} + v - \phi_{,}' = \frac{\phi\ (\phi' + u)}{\phi + u}$$

And if ϕ be taken as the distance representing $V = 1$

$$V' = \frac{\phi' + u}{\phi + u} \quad . \quad . \quad . \quad . \quad . \quad . \quad 1.)$$

or putting $a = \frac{1 \text{ metre}}{u}$

$$V' = \frac{a\ \phi' + 1}{a\ \phi + 1} \quad . \quad . \quad . \quad . \quad . \quad . \quad 1\ \alpha.)$$

and giving ϕ and ϕ' their average values according to Helmholtz:

$$V' = \frac{1 + \cdot 020713a}{1 + \cdot 015498a} \quad . \quad . \quad . \quad . \quad . \quad . \quad 1\ \beta.)$$

When an axial ametropia is corrected by a lens at the anterior focus of the eye $\phi_{,} = \phi$, and therefore for distant objects the visual acuity of the ametropic is

* *Vide* Phys. Optics, Second Edition, p. 79.

equal to that of the equally refracting emmetropic eye. But when the corrected ametropic eye accommodates for a certain distance the same addition to the refractive power of the crystalline lens is not required as in emmetropia. In the case of corrected myopia we have seen that the amplitude of accommodation is increased; that is to say the same addition to the crystalline lens effects a greater refractive change than if the concave glass were not present in front of the eye; consequently the accommodation for any particular distance is got by a smaller alteration in the curvature of the lens than is required in the emmetropic eye for the accommodation for the same distance. The result of this is then a smaller change in the distance between the second nodal point and the retina, and consequently a less relative visual acuity than in emmetropia. In the hypermetropic eye the opposite holds good; the presence of the correcting glass diminishes the range of accommodation, and a greater addition to the curvature of the lens is required for the accommodation of objects at a definite distance than is required by the emmetropic eye for the same distance; the relative visual acuity is therefore greater than in emmetropia. If we write a_L' instead of a for the value of the dioptric lens representing the accommodation required when L′ is the number of the correcting glass at the anterior focus, 1a) becomes applicable to the case of ametropia corrected in this position, as we have seen that then $\phi = \phi_,$ The expression may then be written:

$$V' = \frac{a_L' \phi' + 1}{a_L' \phi + 1} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad 2)$$

As a_L' is less than a in the case of myopia and greater than a in the case of hypermetropia, the relative acuity of vision is less in myopia and greater in hypermetropia than in emmetropia. This result may be written:

$$V'_H > V'_E > V'_M$$

As an example take the cases of H fully corrected by $+5{\cdot}0$, and M fully corrected by $-5{\cdot}0$ at the anterior focus, and each accommodated for the distance of 10 ctm. from the first principal plane.

In the case of H $5{\cdot}0$, $a_L' = 11{\cdot}58$

$$\therefore \quad V'_{H\,5\cdot0} = \frac{11{\cdot}58 \times {\cdot}020713 + 1}{11{\cdot}58 \times {\cdot}015498 + 1} = 1{\cdot}0512$$

In the case of M $5{\cdot}0$, $a_{L'} = 8{\cdot}71$

$$\therefore \quad V'_{M\,5\cdot0} = \frac{8{\cdot}71 \times {\cdot}020713 + 1}{8{\cdot}71 \times {\cdot}015498 + 1} = 1{\cdot}04$$

For E accommodated for the same distance $a = 10$

$$\therefore \quad V'_E = \frac{10 \times {\cdot}020713 + 1}{10 \times {\cdot}015498 + 1} = 1{\cdot}04516$$

If we put V'_E for 10 ctm. $= 1$ we have

V'_{H5} for 10 ctm. $= 1{\cdot}0058$

and V'_{M5} for 10 ctm. $= {\cdot}995$

When the correcting glass is not at the anterior focus 2) does not hold good, as then $\phi_{,}$ is no longer equal to ϕ Still there is the same lagging behind in the increase of the visual acuity of the corrected myopic eye accommodated for nearer and nearer objects when compared with the emmetropic, and the same more rapid increase in the relative visual acuity of the hypermetropic eye as in the special case considered.

The general expression for V′ may be given in the following form :—

$$V' = \frac{a_L'\phi'_{,} + 1}{a_L'\phi_{,} + 1} \quad . \quad . \quad . \quad . \quad . \quad . \quad 2\,a.)$$

When f is the distance from the first principal point to that for which the eye is accommodated,

$$a = \frac{1 \text{ metre}}{f} \ , \quad \phi_{,} = \frac{\phi f}{\phi + f - D}$$

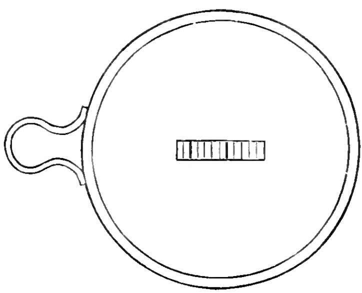
R the distance of the far point from the first principal point, $L' = \frac{1 \text{ metre}}{R - D}$, and a_L = the imaginary dioptric lens, which situated in the principal plane of the eye would with L′ at the distance, D in front of this plane bring about an accommodation for a point at the distance f from it. The slight difference which the correcting glass when not at the focal point of the eye makes in the position of the anterior principal point, and therefore in the visual angle, has not been taken into account, as in any case the expression is not absolutely correct owing to the position assumed for the accommodative change in the eye.

A KERATOMETER.

By Priestley Smith.

This little instrument was devised for the purpose of measuring the diameter of the cornea, and may for convenience be dignified by the name which I have applied to it above. It can be used also as a pupillometer, and for measuring other small objects with which an ordinary measuring scale cannot be brought into close contact.

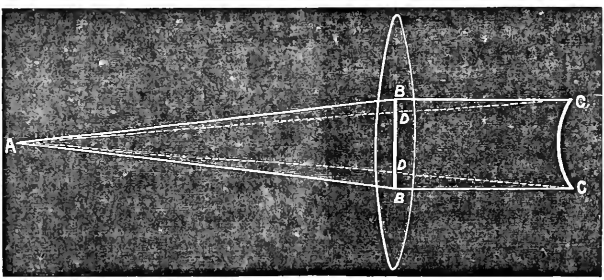
It consists of a narrow strip of paper marked in millimetres placed between two plano-convex lenses,



which, together, have a focal distance of 10 inches (25 centimetres, about), and which are mounted after the

fashion of an ordinary eye-glass as shown in the accompanying figure. The length of the paper scale is 12 m.m., this being a little greater than the average diameter of the human cornea, and to facilitate the reading of smaller measurements the fifth and the tenth lines on the scale are distinguished from the others by being thicker. The combination of the lens with the scale enables the observer to make an accurate measurement of the cornea without placing the scale in contact with the eye of the patient. The principle is very simple.

In the second figure the lens is seen edgeways with the scale BB in its interior, and at a short distance to the right of it is a cornea CC, 12 m.m. in diameter. The lines CBA CBA represent two rays of light falling upon the lens in parallel directions and refracted by it to a focus at A, 10 inches distant from it. (The refraction of the lens is exaggerated in the diagram.) The eye of the observer being placed at A, the extremities of the



cornea CC are seen in the directions AB AB, and therefore appear to coincide with the extremities of the scale BB; in other words, the cornea and the scale appear of the same size. In the absence of the lens the cornea and scale would appear of the same size only when close together, *i.e.*, when equally distant from the eye of the observer; when placed as in the diagram, the cornea, being more distant than the scale, would subtend a smaller

visual angle and be seen smaller than it. If measured by means of the scale in this position its diameter would appear to be equal to DD on the scale.

The distance between the scale and the cornea must not be great, for the eye of the observer cannot at one and the same time accommodate itself for objects at different distances; but this difficulty does not arise when the keratometer is held at about one inch or rather less from the patient's eye, and this is practically the most convenient distance.

The patient is told to look at the eye of the observer, or, more conveniently, at the brow above it. The keratometer is held in front of the patient's eye with the scale horizontal and just below the middle of the pupil, the handle, of course, being to the temporal side. The observer places his eye at a distance of 10 inches from the keratometer. In order to obtain this distance accurately I at first attached a thread to the keratometer with a button on the other end of it which I held between my teeth, but I soon found that one judges the distance with sufficient accuracy without this help. The observer may control the distance by placing the tip of his thumb against his own forehead and expanding his fingers as widely as possible; the patient's forehead should be just beyond the reach of the little finger. Experiment shows that the measurement is not appreciably affected by an error of an inch in the position of the observer's eye.

It is much more difficult to measure the vertical diameter of the cornea than the horizontal, and I have usually contented myself with measuring the horizontal meridian only, and if this is obviously greater than the vertical, which it sometimes is, have made a note of the oval form.

Seeing that the margin of the cornea is not a sharply defined line, it is impossible to determine its position to a small fraction of a millimetre. I do not think that

measurements to less than half a millimetre can be made with advantage in many cases; I therefore do not attempt them in any, but record the measurement as 12, 11.5, 11, 10.5, &c., as the case may be.

I hope before long to have collected a sufficient number of observations to justify a generalisation as to the average diameter of the human cornea at different periods of life, and in eyes of different refractive types, and further to show with certainty whether and to what extent a sub-normal size of the cornea is related to the occurrence of primary glaucoma (see Trans. Ophth. Society, Vol. V., p. 303). At the present moment I desire merely to bring the new keratometer, by means of which such observations are greatly facilitated, to the notice of those who may care to use it. I cannot at present make any definite numerical statement on the point, but I can say positively that a cornea of sub-normal size is present in a very considerable proportion of cases of primary glaucoma, and I would earnestly suggest that systematic measurements should be made in such cases. Having lately received a great mass of material laboriously collected by friends for the purposes of a statistical enquiry connected with the same subject (*Primary Glaucoma in Relation to Age, loc. cit.*), I hesitate to make any further request of the same kind; but should any readers of the *Review* be willing to further the enquiry by taking systematic measurements of the cornea in the cases of primary glaucoma which occur in their practice, I shall most gladly forward printed forms for recording them on a uniform system.

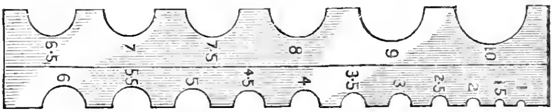
Apart altogether from the pathological question just referred to, a ready means of measuring the cornea will, I think, be found to have some value in connection with operations for cataract and for glaucoma.

Messrs. Pickard and Curry kindly made the keratometer for me, and are prepared to supply others at a small cost.

A NEW PUPILLOMETER.

By Walter H. H. Jessop, M.B., F.R.C.S.

This pupillometer consists of an oblong piece of metal in the sides of which are cut semi-circular hollows ranging from 1 mm. to 10 mm. in diameter, as shown in the accompanying illustration. The object aimed at has



been to get a measure which can be placed close to the eye without cutting off too much light. The instrument rendered good service in the course of my investigations on the action of cocaine and other drugs on the eyes of rabbits, &c. The ordinary circular forms are less easy to use, especially when the pupil is irregular or oval. It is made by Messrs. Pickard and Curry

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C. H. May (New York). Enucleation with Transplantation and Reimplantation of Eyes. *Medical Record, May* 29, 1886.

This paper briefly reviews the various attempts which have been made during the last two years to engraft the freshly removed eye of an animal in the human orbit as a substitute for the lost human eye. Secondly, it records the results obtained and the changes observed in a series of experimental operations performed upon rabbits. We notice the subject on account of its physiological interest, and in the hope that the extensive experience recorded by the author may render further experiments of the same kind unnecessary, rather than from any idea that the transplantation of the eyes of animals into the human subject is likely ever to be of real value or, even if successful from the surgeon's point of view, to be generally acceptable to the one-eyed members of the community.

The first mention of this operation occurs in the *Revue Générale d'Ophthalmologie*, May 31, 1885. The following is a translated abstract:—The operation was performed by Dr. Chibret on May 4, 1885. The staphylomatous and buphthalmic eye of a girl of seventeen was removed, and the eye of a rabbit inserted into the conjunctival sac; sutures were passed from the patient's conjunctiva into the margin of the cornea above and below, and the transplanted organ thus kept in place. The eye was then bandaged. The operation was a failure, for on the fifteenth day the cornea, which had gradually been changing from hazy to an ulcerated condition, sloughed away, and the eyeball was destroyed. This failure the originator of the operation attributed to contact of threads with the cornea and the thinness of the rabbit's cornea. He claims to have had a rather sudden and complete return of sensibility of the transplanted cornea on the tenth day; the vascular and muscular union of the transplanted eyeball the operator found good.

Subsequently, in the same journal, under date of October 1, 1885, Dr. Chibret reviews the operation, and condemns further transplantations until reports shall have been furnished giving the results of the operation in animals.

Transplantation was next performed by M. Terrier, June 15, 1885; his report to the Société de Chirurgie of Paris, December 2, 1885, reviews the operation, and gives the results of this and a subsequent transplantation. In this, the second recorded case, sloughing of the cornea resulted on the third day.

The third case was one of M. Rohmer, June 22, 1885, and the cornea was destroyed on the seventh day.

The next transplantation was performed by Dr. H. W. Bradford, of Boston, and is reported in *The Boston Medical and Surgical Journal* of September 17, 1885. His method differed from previous ones in that the optic nerve was sutured to the stump of the nerve remaining upon the globe of the rabbit's eye; considerable sub-conjunctival tissue was left, to which the muscles of the orbit were united, and the conjunctival sac sutured to the margin of conjunctiva left surrounding the rabbit's cornea. The observation ends on the eighteenth day after operation, and the following is the reported result:— "Conformation and tension good; cornea improving, and has

cleared peripherally so as to allow the iris to be distinctly seen; chemosis of the conjunctiva has disappeared, although the membrane remains congested; exposed sclerotic on outer side of eye practically covered by the conjunctiva; ocular movements in all directions good." This case is reported as a successful one.

The fifth and final reported case was reported by M. Terrier, October 19, 1885, and, although he adopted part of Dr. Bradford's plan, the operation was a failure.

Thus, of the five operations, four were failures—the cornea sloughing in each case. Even the successful Boston case is rendered doubtful by the fact that the report extends only over eighteen days, especially as cases are reported by May in which the cornea remained of good consistence, though hazy, for fifteen or sixteen days, and yet sloughed afterwards when exposed to the atmosphere.

In four of these cases a rabbit's eye was employed; in one, a dog's eye—this was one of the unsuccessful cases. Leaving out Dr. Bradford's case, the others are admitted failures: so that, at best, the success of the operation has not been established. In order to study the matter further May performed a series of twenty-four operations of the kind in question upon rabbits. The following summary of the results, and the conclusions which he derives from them, we reprint almost verbatim from his paper.

The results of the twenty-four operations justify further trials upon the eyes of man, at least the transplantation of the rabbit's globe into the human conjunctival sac. (Our author would try transplantations of eyes from one human being to another, but he remembers that "there are moral objections to the disabling of one human being for the cosmetic improvement of another.") The operation must be placed among the perfectly feasible ones: thus, in five cases (one reimplantation and four transplantations), in which the bandage was kept well in place during 21, 21, 28, 34, and 36 days respectively, the conditions of the transplanted organ at the end of these periods was very favourable: the eyeball of good conformity, the cornea hazy but clearing, the tension good.

Any one of these eyes as they were at the time of writing would have been a great improvement upon many

staphylomatous or atrophied eye-balls, or those the seat of dense leucoma. An artificial eye is a foreign body, and from time to time excites inflammation; it has to be renewed every two years, and is expensive. In rabbits, eyes of all colours may be found, brown, black, grey, dark blue; pale blue the writer has not yet met with.

The rabbit's eye is smaller than the adult human eye; it varies from 18 to 23·5 mm. in diameter. Were there any demand for rabbits' eyes large animals could be bred for the purpose. The writer is now attempting this, with a doe whose eyes measure 23·5 mm. transversely, and a buck of equal size. The arrangement of muscles in the rabbit is identical with that in man. The ophthalmoscopic appearances of the fundus of the rabbit are somewhat different from those in man; the arrangement of blood-vessels is the same.

In no case was there any rise of temperature or any apparent interference with the general health, or the slightest implication of the sound eye. Hence, even though the operation fails, no injury will have been done, for even in all the unfavourable cases a stump remained at least as good as that resulting after ordinary enucleation, while in most of these cases the stump afforded a better rest for an artificial eye than would have been obtained in an ordinary enucleation.

Method of operating.—The operations were done with strict antiseptic precautions. The instruments were washed and wiped with alcohol, and previous to use dipped into a saturated solution of boric acid. The eye was kept constantly wet with a solution of corrosive sublimate (1 to 10,000). Two rabbits of equal size were anæsthetised, and a spring speculum introduced beneath the lids of the eye to be removed. With forceps, the conjunctiva and Tenon's capsule over the insertion of the rectus superior were raised, and cut into with the blunt straight scissors; with the blunt hook the muscle was caught, a thread passed through muscle and conjunctiva to secure both, and the insertion of the muscle divided. This was done with each of the recti muscles, and the intervening conjunctiva was cut at about an eighth of an inch from the corneal margin. A thread was then passed through the conjunctiva of the eyeball opposite the superior rectus, and knotted so as to give the relations of the eyeball after removal. The

subconjunctival tissue around the eyeball having been severed, and as much as possible having been left upon the eyeball, the latter was made to protrude and the optic nerve divided by blunt pointed scissors curved on the flat, at about an eighth of an inch from its entrance. The enucleated eyeball was now placed in a saturated solution of boric acid and covered by cotton.

The eye of another rabbit was enucleated in a similar manner. After hæmorrhage had ceased in the socket of the first rabbit, the optic nerve was sought for, caught with the forceps, and the smallest-size catgut suture, previously soaked in the sublimate solution and threaded upon a very delicate curved needle, passed through it at about an eighth of an inch from the extremity; the same needle was then passed through the stump of the nerve attached to the eyeball of the second rabbit, the two ends approximated by tightening the suture, the latter tied twice and cut off short. By means of the four threads attached to the recti muscles and conjunctiva, the conjunctival sac was drawn over the eyeball and then stitched to the conjunctiva surrounding the cornea of the transplanted organ; this was done by eight stitches of smallest-sized iron-dyed silk; four of these stitches were passed through recti muscles and overlying conjunctiva on the one hand, and secured to the rim of pericorneal conjunctiva on the other; the remaining four passing in the intermuscular intervals and securing the two edges of conjunctiva only.

The eyeball having been thoroughly washed with solution of bichloride (1 to 10,000), the lids were sewed together by two silk sutures transfixing their edges, white vaseline smeared over them, and successive discs of borated cotton applied so as to form a firm and even compress. Over this a $\frac{5}{6}$ inch (four yards long) flannel bandage was applied. The unoperated eye was left uncovered. The whole was covered by a specially contrived chamois mask, provided with openings for the ears, for the unbandaged eye, the neck, and mouth, so that every part of the skull was enveloped with the exception of the parts mentioned; this chamois covering was tightened by lacing, and was sewed on the underlying bandage at several places so as to prevent slipping. The bandages were left on, when possible, a week, or longer. Suppuration under the bandage

was the exception. The operations lasted about one hour; the transplanted eyes remained in the boric acid solution from ten to twenty minutes; this time being necessary for enucleating the second eye, checking hæmorrhage, and securing the nerve. The animal recovered rapidly from the effects of the ether.

Considerable difficulty often presented itself in catching up the divided optic nerve and in passing the suture. Hence the writer suggests special forceps and needle.

Changes in the transplanted and reimplanted eyeballs.—The first seven cases were left unbandaged, and degeneration (sclerosis or sloughing) of the cornea was the invariable result. The next seven cases were bandaged, but the method was unequal to the task of preventing displacement or removal from the incessant attempts of the animal to get off the dressings; the result was that the cornea degenerated (sclerosis or sloughing) soon after the bandage was removed, though it had remained in good condition while the dressings were well in place. In the remaining ten cases, the bandage was displaced in Cases 17 and 18 and was removed, put on too tightly, and had to be removed in Cases 19 and 20; here, again, the cases progressed favourably until the bandage became displaced and had to be removed. This obstacle to the success of the operation in eighteen out of the twenty-four cases was a considerable one; in six cases it was overcome by the aid of the chamois covering.

Throughout the experiments all unbandaged operated eyes were washed out thoroughly with the bichloride solution (1 to 10,000) twice a day, and this was also done when the dressings were removed prior to rebandaging.

In six cases the bandage stayed in place throughout, and the result was very favourable and satisfactory.

This proves that protection of the cornea from atmospheric contact is essential; when this was maintained, success was the result. The influence of the atmosphere is easily explained—the *cornea remained insensitive throughout in all cases*, the ciliary nerve-supply having been cut off; foreign bodies in the atmosphere settling upon the cornea excite no sensation, and remaining, without being washed off by the tears and movements of the lids, produce inflammation and degeneration of

the cornea.* This was well illustrated in the cases in which no bandage was applied; in all of these cases, the portion of the cornea which was first to slough—in fact, the only portion which sloughed at all—was a central elliptical portion corresponding to the part most exposed.

By watching closely, the writer found that in sleeping the animals did not close the lids completely on the affected side, and the central elliptical portion corresponded to the space left between their margins. In other cases, in which the bandage had become displaced, the sloughy portion of the cornea corresponded to the exposed portion; in one case, in which the stitches holding the lids together had been rather loosely applied, a linear area of degeneration of the cornea showed where it had been exposed. The cornea must be protected until there is a return of sensibility. The parts supplied by direct branches from the fifth nerve, such as the nares, lids, and nasal mucous membrane, were not affected in any of the cases.

Under the microscope, the degenerated corneæ were found to be infiltrated with small, round, and polygonal, and larger fusiform cells, chiefly between the corneal fibres, and the latter were more opaque than normal; the epithelium of the surface was wanting in some places, and at others was markedly increased, causing a heaping up of cells.

The rapidity with which the ocular muscles attached themselves to the transplanted eyeball was wonderful; it occurred as early as the third day—in most cases by the seventh day, in a few only as late as the tenth day. This muscular connection was ascertained by dissection, and by associated movements transmitted from the other eye—a piece of carrot or some bright object was passed in varying directions in front of the sound eye, and the transplanted organ watched for associated motion; it was also ascertained, when the animal paid no attention to these objects, by moving the eye-ball in varying directions with forceps, and noting the amount of resistance. Under the microscope the muscles showed very little fatty degeneration.

* Is not loss of moisture by evaporation the chief cause of the death of the exposed tissue? This, together with the arrest of its lymph supply, would imperil the corneal epithelium, just as exposure after the free use of cocain does. See Würdinger, O. R., Vol. V., p. 128.—P. S.

The connective tissue union between the eyeball and surrounding capsule of conjunctiva was also effected quite rapidly; in one case being considerable at the end of four and a half days, as found by dissection.

Vascularity of the rim of conjunctiva attached to the transplanted eyeball was demonstrated in one case of reimplantation on the fifth day, and in most cases on the eighth or tenth day; it would show itself by a red rim around some portion of the cornea, and between the eighth and tenth days, in most cases, blood-vessels could be traced with the naked eye, passing from the palpebral to the ocular conjunctiva, and thence to the rim of conjunctiva of the transplanted organ.

The tension of the eyeball began to diminish as early as the sixth hour (allowing a slight diminution present in all cases after enucleation), in most cases on the second day, when no bandage was applied; when bandaged well, tension remained normal throughout.

In some of the unbandaged cases the conformity of the eyeball was retained, and the eyeball was simply the seat of atrophy and hardening; but in most of these unprotected eyes the cornea sloughed, the contents of the eyeball escaped, and a small or medium sized, non-sensitive, retracted stump remained. In the bandaged cases the conformity of the eyeball remained good.

The changes in the optic nerve presented the well-known Wallerian degeneration; even with lower power enlargement, the difference, as shown by Weigert's copper-hæmatoxylon staining, was well marked in all cases; the central end of the nerve was found to terminate abruptly, and to be the seat of degeneration. In all cases there was union of the sutured ends of the nerve; even in a case examined four and one-half days after suturing, the intervening substance between the central part of the nerve and the eyeball consisted in early stages of granulation tissue (small round cells, with very little intercellular elements), in later stages of fusiform cells mingled with connective tissue fibres, some fat-vesicles and blood-vessels; later still, the connective tissue became firmer, but no nervous elements passed between eyeball and nerve in any case examined; the retinæ were invariably degenerated. The

point of junction, where the nerve had been sutured, presented usually a small bulbous enlargement, so as to have a greater diameter than the nerve itself; the catgut suture had been absorbed in all cases.

Hermann Cohn (Breslau). The Hygiene of the Eye in Schools. *An English Translation, edited by W. P. Turnbull, formerly Fellow of Trinity College, Cambridge, and afterwards Fellow of St. Catharine's College, Cambridge. London: Simpkin, Marshall, and Co.; Birmingham and Leicester: Midland Educational Co.*

Professor Cohn's labours for the improvement of school hygiene, especially in relation to the prevention of myopia, are well known to our readers. The German edition of the present work is probably in the hands of many of them. It will, therefore, be unnecessary to review this translation in detail, and the more so that we have lately given much of the substance of this work in reviewing the essay by Professor Fuchs on the Prevention of Blindness (*Vide* O. R., Vol. IV., p. 93, &c.). There are, however, some points in it which call for notice.

The original work was written expressly for the use of non-medical readers, such as school-masters, directors of education, and others with whom the power lies to introduce the reforms which are needed. It opens with several chapters on the anatomy and physiology of the eye, which contain, the author tells us, nothing but what is absolutely necessary for the comprehension of the chapters on hygiene proper. This portion of the work is not very satisfactory. Dr. Cohn's description of the eye and its function is, we think, not a very good one for the purpose in question, being loaded with anatomical details insufficiently explained; and when we turn to the English version the matter is worse, for here we find mistakes and mistranslations which render many passages unintelligible or even misleading. The following are examples:— "The margin of the lens, called the equator, is laminated; it possesses a skin and a nucleus, and can to some extent alter its shape." . . . . . "the front plate and the back plate

of the zonule of zinn." . . . . "The eye can move without altering its place ; it is simply turned in any direction, upon its pivot, which is situated at about the centre of the eye-ball." "The crystalline lens is elastic, and would, if left to itself, assume a much more spherical form than it has in life. There exists, however, a muscle at the margin of the lens which, by contracting, flattens it permanently, ... This muscle, which surrounds the lens in radiating folds not unlike a frill, is called the *zonula zinnii*." A more unfortunate mistake than this last could hardly have been contrived. In the latter chapters of the book the translator has been more successful, but even here a good many passages are marred by a too close adherence to the German construction, or by insufficient knowledge of the true English equivalent.

Following the chapters explaining the nature of hyperopia and myopia comes a statement of the very extensive statistical enquiries which, beginning with Dr. Cohn's own original and most valuable labours in Breslau, have been made during the last twenty years in many parts of the world. The author then discusses in detail the various factors connected with school life in which reform is needed in the interest of the eye-sight of the scholars.

Chapter XI. describes the ill effects of bad desks and seats, and explains the various mechanical means invented for the purpose of obviating them. It is interesting to note how rapidly the industry of school-desk making has developed of late years. Thus in the Paris Exhibition of 1867, three different models were exhibited; at Vienna in 1873, there were forty-seven different kinds; in Paris in 1878, there were seventy-one. The essential principles have more than once been discussed in this Review, and some further recent models have lately been described, so we may pass the subject, merely noting with regret that even in Breslau, and in spite of Dr. Cohn's energetic protests, desks of faulty construction have within recent years been introduced in large numbers into the new schools.

Next comes a description of the so-called "straight-holders" (grade-halter), props or frames of one kind or another interposed between the desk and the chin or forehead of the child,

in order that undue stooping of the head shall be impossible. The best of these, according to Cohn, is a face-rest made by Kallmann, of Breslau, which can be screwed to any height on any table. He adds, "I never allow my own children to write without it, whether at home or in school, even when sitting at the best possible desk. It does not cause the least annoyance in writing; the children soon grow accustomed to it; and even with old, wrongly-constructed desks, that is with plus distance, it is impossible for the child to bend his head down. . . . . The face-rest will certainly contribute to the prevention of short-sight." Truly education is becoming a formidable ordeal for the child.

The next two chapters deal with the lighting of school-rooms by day and by night, and here we find two interesting supplements written expressly for the English edition. In the first are described two new instruments invented by Dr. L. Weber, Professor of Physics at Breslau, as a means of measuring the amount of light available in the school-room. Weber's standard of light-measurement is the *metre-candle*, that is, the brightness of white paper exposed to a normal candle one metre distant, the normal candle being a candle of spermaceti or stearine of the size which has six to the pound. Weber's photometer consists essentially of a fixed horizontal tube containing a candle, and at right angles, with this a moveable tube which admits the daylight or other light to be measured. In each tube the light falls on a diaphragm of milk-white glass. By means of a prism the light from the candle is altered in direction in such a way that the observer, looking into the moveable tube, sees a disc, one half of which is illuminated by the known light of the candle, the other by the light which is to be measured. The measurement is effected by an adjustment which enables the observer to equalise the intensities of illumination in the two halves. Since it is difficult or impossible to compare white day-light with the yellow light of the candle, a piece of red glass, which allows the passage of red rays only, is placed before the eye-piece, so that when the adjustment is made, both halves of the field of vision appear not only equally bright, but of the same colour. With this instrument, the amount of light, natural or artificial, at any scholar's place, may be determined in a minute, and thus,

Cohn says, begins "a new era in the science of school-lighting." He records a number of observations showing in accurate numerical fashion a great deficiency of light in certain school-rooms. As the result of many comparisons he fixes the minimum illumination which should be allowed in the darkest place in the room on a dull day as equal to ten metre candles. A practical obstacle to the general use of this photometer is its high price—£15.

Weber's second instrument is a so-called steriogoneometer, or solid angle measure,—a kind of camera, by means of which a sheet of paper, divided into squares so as to facilitate area-measurement receives a picture of that portion of the sky visible from any part of the school-room in which the instrument may be placed. This is a useful means of estimating the amount of day-light available in various parts of a class-room. At the end of this chapter comes the practical suggestion, that such of the old-fashioned dark school-rooms as cannot be got rid of should be improved by means of the large adjustable window mirrors which are already so much used for the brightening of dark offices.

In the second supplement the advantages and disadvantages of various means of artificial lighting are discussed. The minimum illumination which Cohn considers satisfactory is that in which the brightness of the paper is equal to ten metre candles. This formula, however, leads to the surprising conclusion, that even with the best globes, gas and petroleum flames should not be used for reading and writing at a greater side-distance than half a metre (twenty inches). From the oculist's point of view, the introduction of the electric light into schools is strongly advocated.

The remaining chapters deal with hand-writing; slates and black-boards; writing, drawing, and needle-work lessons; print and paper; the use of spectacles; over-work of the eyes; diseases of the conjunctiva; the school doctor. In order that the requirements of hygienic-science in relation to the eye-sight of school children may be intelligently and systematically carried out, the appointment of medical inspectors of schools is urgently advocated.

We trust that this book may find its way into the hands of those who are able to carry its teaching into practical effect.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, OCTOBER 21ST, 1886.

GEORGE JOHNSON, M.D., F.R.S., Vice-President, in the Chair.

(Abridged from *Brit. Med. Jour.*, Oct. 30th, 1886.)

Albuminuria and Retinitis.—In the unavoidable absence of the President, Dr. Johnson (Vice-President) delivered a short introductory address, chiefly bearing on the importance of the early recognition of chronic renal disease, and of the great value of albuminuric retinitis in aiding an early diagnosis. The practical inference was that the urine of every patient, whether medical or surgical, no matter how apparently trivial his ailment, should be tested for albumen, and that, too, at different periods of the twenty-four hours.

Orbital Tumour.—Mr. Critchett and Mr. Juler. A young woman, aged 21, in August, 1885, first noticed that the left eye was becoming prominent, and that there was a swelling in the region of the left zygoma. When under observation at Christmas there was much proptosis, but the eye did not deviate, and there was no diplopia; there was considerable swelling about the zygoma. Six months later the eye still protruded, and there was a marked tumour in the zygomatic region. Some carious teeth were taken out without benefit. Iodide of potassium in ten-grain doses three times a day was given, and since then there had been steady improvement, the proptosis having now almost completely disappeared. Previous to this, the case had been regarded as one of malignant disease. In reply to questions, Mr. Juler stated that the iodide of potassium was begun early, and that there was never any pulsation in the orbit.

Mr. F. R. Cross mentioned a case of tumour in the orbit, with much swelling in the pterygoid region, where very large doses of iodide of potassium and mercury had failed, the tumour gradually subsiding, when the cure was left to Nature, aided by tonics.

Ophthalmoplegia Interna.—Mr. Adams Frost. A patient with ophthalmoplegia interna of the right eye. The sight of this eye, when the patient was first seen, had been defective for three or four months; the pupil was inactive, measuring from three to five millimètres. The left eye had been normal in all respects until quite recently. There was loss of knee-jerk, but no other general symptom of disease. There never had been any lightning pains; his gait was normal, and he could walk steadily with his eyes shut; he had not had diphtheria; there was no optic atrophy; he was slightly hypermetropic. He had been treated with iodide of potassium for some months.

Retinitis Pigmentosa.—Mr. Frost. A man, aged 35, with retinitis pigmentosa and a deposit of pigment on the anterior surface of the lens; vision had rapidly failed during the preceding three months.

Penetrating Wounds of the Eyeball.—Mr. F. R. Cross. Two patients in whom a penetrating wound of the sclerotic had occurred. In one, a girl, there had been very little escape of vitreous, and the scar was three-fourths of an inch long; in the other, a man, there had been considerable loss of vitreous, but the ciliary body had escaped in both, and recovery had been good. These cases showed that an eye should not be too hastily removed for a penetrating wound.

Dr. Brailey had met with an even more remarkable instance of recovery in a boy who had a great prolapse of vitreous after an injury.

Dr. Mules had twice removed a foreign body from the interior of the eye without any bad result; he attributed the absence of reaction in his cases to the removal having been very early after the injury.

Enlargement of the Lachrymal Glands.—Mr. Power. A boy who had come under care with swelling at the outer side of each orbit. After referring to the great rarity of symmetrical enlargement of the lachrymal glands, Mr. Power said that in the present case iodide of potassium, mercury, and iodine applied locally failed, and as the swelling, especially on the left side, was getting larger and more painful, the whole left

gland was removed by an incision made through the skin. There had been no trouble since the operation a fortnight previously, and the cornea and conjunctiva were quite moist.

Mr. McHardy asked whether any cause could be assigned for this affection, and instanced a case where a very sudden enlargement of both glands had appeared to be due to suppression of tears; the swelling had subsided spontaneously. He had sometimes removed the gland after injuries, and had had some trouble with the flow of tears from portions that were left behind.

Mr. Power, in reply, said that no cause could be made out. There was a history of two falls on the side of the head.

New Instrument.—Mr. Stanford Morton showed a new method of rapidly changing ophthalmoscopic mirrors.

Optic Neuritis in Head-Injuries.—Dr. Walter Edmunds and Dr. J. B. Lawford read a communication based on twenty-four cases of head-injury, in which the condition of the optic nerves had been observed either ophthalmoscopically or microscopically. The microscopic evidence of neuritis consists in a considerable increase of staining corpuscles in the sheath space and in the nerve. The cases were divided into three groups. 1. Cases which ended fatally, directly from the severity of the head-injury; 11 cases, 4 of which had optic neuritis, were included in this group. 2. Cases which ended fatally, indirectly from complications; this group comprised 4 cases, 2 of which had optic neuritis. 3. Cases which recovered; 8 cases, 6 of which had optic neuritis, were included in this group. The optic neuritis was attributed to spread of inflammation from the seat of injury to the optic nerves; this might take place either along nerve-tissue, or by the meninges. The authors adopted the latter view because:—1. While in some of the cases in which there was optic neuritis, basal meningitis was found, it never occurred in those cases in which optic neuritis was absent. 2. Those cases in which the base of the skull or brain was injured generally had optic neuritis, while those in which the injury was confined to the convexity of the brain, such as punctured wounds, had not. 3. In some cases of neuritis, transverse sections of the optic

nerves showed the inflammation most marked at the periphery of the nerves and in the sheath space.

Dr. Brailey, referring to the microscopical drawings exhibited, said that there were evidently two distinct classes of cases, and his own experience quite confirmed this—one in which there was considerable effusion between the pial and dural sheath, and the other in which the bulk of the inflammation was found in the inter-trabeclar tissue. How were these differences to be accounted for?

Dr. Edmunds, in reply to Dr. Silcock, said that in the case of injury to the vertex without optic neuritis, there was meningitis at the vertex, but not at the base. In reply to Dr. Brailey, he pointed out that the drawings represented different stages of the affection; the one where the effusion was outside the pial sheath was from a case which proved fatal in a few hours; the other showed the changes which occurred when death took place some days later. He thought that would account for the apparent differences.

Ophthalmoplegia dependent upon Thrombosis of the Cavernous Sinuses.—Dr. Sidney Coupland. An unmarried woman, 43 years of age, was admitted into the Middlesex Hospital under his care on March 10, 1886, suffering from cerebral symptoms, including bilateral ophthalmoplegia. Her previous health had always been good; and, excepting that her father and one brother were said to have died of consumption, there was no history of inherited taint. No evidence of syphilis. In January and February she had attended Moorfields Hospital, under the care of Mr. Hulke. From notes by Mr. W. Gay, her condition during this period may be summed up as "proptosis and more or less complete ophthalmoplegia externa of the left eye, following great supra-orbital pain, succeeded by proptosis of right eye, with ophthalmoplegia externa and (?) interna, but with no distinct ophthalmoscopic changes." The symptoms had commenced with headache and deafness of the left ear, four months before any ocular trouble; iridoplegia and strabismus, and then left ptosis, supervened. When admitted into the Middlesex Hospital she was drowsy, but pointed to the right forehead when questioned as to pain. The face was dusky; no enlargement of veins around orbits or elsewhere,

and no œdema of lids; marked proptosis of each eyeball; complete ptosis of right lid, partial of left. Right eye absolutely immobile in any direction; left, slight power of movement inwards only. Both pupils large, the right more dilated than the left; total reflex iridoplegia. No optic neuritis or other notable ophthalmoscopic change; veins not dilated; ocular conjunctiva, especially of left eye, injected; on each side quite insensitive. Cutaneous sensibility of left side of face impaired as compared with right, but not wholly abolished. No facial paralysis. Deafness, but degree could not be ascertained. No otorrhœa; some dysphagia. Tongue protruded straight; arms semiflexed; slight rigidity. Legs flaccid, but movements controlled by patient. No plantar reflex on right side; slight on left. Abdominal and epigastric reflexes absent on both sides. Knee-jerk absent on both sides; no ankle-clonus. Cutaneous sensibility impaired over lower limbs and trunk; loss of voluntary control over bladder. Next day the patient lay with her head turned to the left, and cried out with pain if it were moved. This symptom remained till death, which occurred on March 12th, in coma. Towards the close the left conjunctiva became chemosed. At the *post-mortem* examination there was found basic meningitis (both arachnitis and leptomeningitis) of recent date; no tubercle. The pituitary body was enlarged. The cavernous sinuses were plugged with old caseo-purulent and colourless thrombi; and so were the circular and transverse sinuses. The petrosal sinuses were empty. No disease of cranial bones or of internal ear could be detected. The cerebral ventricles were distended with fluid. No lesions in brain; bronchopneumonia of recent date in left lower lobe; slightly granular kidneys. Thus no cause of the thrombosis was discovered; and the clinical course, as well as the character of the exudation, proved that the meningitis was far more recent in origin than, and probably secondary to, the thrombosis. The ophthalmoplegia, at first unilateral and then bilateral, was explained by the complete obliteration of both sinuses, the thrombosis starting in the left sinus. The absence of "choked disc" accorded with general experience, being attributable to the free inosculation of the facial and orbital veins; and to the same anatomical conditions might be ascribed the absence of œdema of the eyelids. Nor was the

degree of proptosis much, if at all, more than might be ascribed to the ophthalmoplegia. The abolition of many of the spinal reflexes was not explained; nor was the deafness, which occurred early in the case. The paper concluded with a review of the causes and symptoms of thrombosis of the cavernous sinuses, with especial reference to the symptom of ophthalmoplegia.

Dr. Coupland, in reply to Dr. Money, said the meningitis was quite recent, and the ophthalmoplegia could not, therefore, have been due to the blocking of a small artery supplying the nerve-centre for the internal muscles of the eye. In reply to Mr. Nettleship, he said that he had only found one case closely resembling his own.

Mr. Lang mentioned the case of a man who, after a blow, had proptosis and chemosis of one eye, suggesting the existence of an abscess, but puncture of the orbit yielded nothing. After death, the right cavernous sinus was found to be plugged by a clot, as to the origin of which no cause could be found; the ophthalmic vein was not plugged in its whole length. There was no bone-disease in the orbit, ear, or elsewhere.

Rapidly Occurring Blindness, and Complete Ophthalmoplegia on one Side; (?) Hysterical.—Dr. Brailey. Anne R., aged 50, single, complained of pain round the left orbit, and numbness of the left side of the head three months previously. One month later she came to Guy's Hospital, stating that she had also pain in the left eyeball, which was always much more severe about 4 A.M. Distant vision, after correction of hypermetropic astigmatism, was perfect. The right eye was totally blind, from a blow with the cork of a soda-water bottle some twenty years ago. Its movements, and those of the lid, were, and have since remained, perfect, except that the internal rectus seems weak. Its pupil is excluded, and the iris bulged. T. n. No other morbid condition can be found. The patient's manner is very quiet and rather constrained. Again, three weeks later (five weeks ago), her friends noticed that the left upper eyelid drooped, and she complained of the sight being gradually worse till two and a-half weeks ago, when it deteriorated very rapidly. Three days later, October 8th, she was led into the out-patient room totally blind. The right eye and

lid moved as before, but the left lid drooped, the eye was immovable, and the pupil was three-parts dilated and fixed. The conjunctiva and skin appeared even more sensitive than normal. The fundus was normal. She was admitted as an in-patient, and was blistered that evening. The next day, October 9th, the outward movement of the eye and that of the pupil was still absent, but the others had come back slightly; still no p.l. She said she had the usual severe pain about 4 A.M.; pot. iod. gr. xv. ter-die. October 12th: Movements as on the 9th; still no, or very doubtful, p.l.; pot. iod. gr. xx. liq. hydrarg. perchlor. ℞ 80 ter.die. October 14th: Says she sees objects with the left eye on its nasal side, but we cannot assure ourselves of this from her answers. October 18th: Undoubtedly sees objects to nasal side, but does not always recognise a light held in this position. October 19th: Counts fingers at a foot distance on the nasal side, in which direction she can see a light; denies seeing it when held to the outer side. The movements above noted are, perhaps, rather more free; others still entirely wanting. Fundus normal. October 21st: Can move the eye outwards for the first time just beyond the middle line; pupil acts very slightly to light. Vision exactly as on 19th. The severe pains have entirely disappeared. Reflexes normal; no deafness. Mr. Kingsford elicited that she had a mental attack, indicated by despondency and a supposed suicidal tendency, twenty-seven years ago. Fourteen years ago, and again twelve years ago, she gave birth to a child. Her conduct at other times has apparently been perfectly good. There is nothing pointing to specific disease. Like others, Dr. Brailey had seen many cases of blindness of one eye, the other remaining good; and also many cases of ptosis; also two cases of paralysis of one inferior rectus, which, from the appearances and after-history, appeared to be hysterical; but never a case of complete ophthalmoplegia externa or interna. Simulation appeared to him to be out of the question, though many points were unsatisfactory in her answers to tests of vision.

Dr. Sharkey recollected a case under the care of Dr. Bristowe, in which a woman who had ophthalmoplegia and profuse bleeding from both ears died, and no lesion of the central nervous system could be found.

Mr. Frost asked what had been made out in regard to the field of vision.

Dr. Brailey said it had been impossible to take the field of vision. All the patient could do was to make out fingers on the nasal side; on the blind side she had not even a perception of light. It was only that morning for the first time that the pupil had acted very slightly to light.

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INVESTIGATIONS IN THE RELATION BETWEEN CONVERGENCE AND ACCOMMODATION OF THE EYES.

By Ernest E. Maddox, M.B., C.M. Edin.

(An abstract of three papers published in "The Journal of Anatomy and Physiology," Vols. XX. and XXI.)

The following epitome presents most of the results obtained, without describing the methods by which they were arrived at, save in one or two cases. The apparatus chiefly employed was the dark camera, figured in Vol. III., p. 291, of the Ophthalmological Society's Reports; but there only the blind spot method of using it was described, since the "direct" and "central" methods, by which most of the present results were

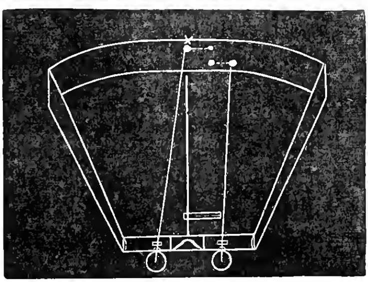

Fig. 1.

Fig. 1. Illustrates the "direct" method. When the apertures *appear* superimposed they are *really* separated by an interval which measures the deviation of the eye; the two outer dots represent their *actual* position, the two inner their *apparent* position.

given, had not then suggested themselves. The use of the direct method (with near vision) to ascertain the relative position of equilibrium of the eyes, when the desire for single vision is annulled, is represented in Fig. 1.

The dark box, into which the eyes look from the narrow end, has a median partition crossed at one point by a rectangular obstructive. At the further end are two luminous apertures, represented by the dots to which lines are drawn from the eyes. The right one is moveable, and its position is quite correctly estimated as long as the obstructive is in the middle, for then the desire for single vision is in exercise. But when the obstructive is pushed to the right, as in the figure, that desire ceases, and the two apertures appear to approach one another. The apertures are at slightly different levels, and when they are adjusted so as to *appear* to be in the same vertical line, a *real* interval separates them, which records automatically on a graduated scale the deviation which occurs. Beginning with distant vision, for which the eyes look *through* the apertures, the results are as follows:—

1. The natural position of equilibrium of the two eyes with distant vision (and therefore negative accommodation) is one of slight convergence of their visual axes. The convergence ranges in the different cases I have tried from a little over 0° to 4°. The average of twelve cases was close upon 2°.

Dr. Bolton found one case with divergence, and another in which convergence noted for some time gave way, after a great nervous expenditure (public speaking), to parallelism, or even slight divergence, which lasted many days.

The rule, therefore, is that when in distant vision one eye is covered by the hand the covered eye turns in. It follows from this that the exact parallelism of the visual axes which occurs in natural binocular vision for distance is only maintained by the active exercise of the desire

for single vision, without which we should have homonymous diplopia of all distant objects from the presence of this "initial convergence," as it may be called.*

2. The degree of initial convergence is exactly the same whether *one* or *both* eyes are engaged in active fixation of distant objects, provided there is no excitation of the desire for single vision.

This shows that the convergence of the covered eye is not due to lessening of its accommodation, and strongly corroborates the fact, already well known, that the effort of accommodation is a single one for both eyes and does not permit of a greater nervous impulse to either ciliary muscle than to the other.

3. In my own case, the amount of initial convergence, as noted by the camera, undergoes a fairly uniform variation through the day, when disturbing causes are avoided. It becomes greater as the day advances, but suffers a very temporary fall after each meal, especially the principal mid-day one. The average a.m. records were $1^\circ\ 5'\ 12''$, and the p.m. records $1^\circ\ 24'\ 33''$, giving a mean of $1^\circ\ 18'\ 43''$; while the after-dinner one was $1^\circ\ 3'\ 4''$. I offer no explanation, though the sympathetic nerve supply to the external rectus is perhaps significant.

4. So delicate is the central connection between accommodation and convergence that the slightest increase of the former alters the position of the visual axis of a covered eye. This associated, or, as it may be called, "accommodative convergence," is of course *added* on to the initial convergence, so that for nearer objects up to a certain distance from the eye there still exists some relative convergence. The convergence associated with each of the first few dioptres is *less* than the metre

* It may be that those patients who cannot in distant vision overcome the weakest prisms (base inwards) are just those who have the greatest initial convergence, so that the desire for single vision has as much as it can do to combat this and maintain parallelism without any reserve of energy to create divergence. But this is merely suggestion for inquiry; there is as yet no proof.

angle, so that the "initial" disproportion between convergence and accommodation is continually lessened till a point is reached, in viewing which it ceases. A covered eye, with vision for this distance, remains *in statu quo*. The average distance of this "point of coincidence" in seven cases was forty-three inches, but it wavers considerably in the same person. I found the point approach after distant vision, and recede after near vision.

5. On analysing the first dioptre of accommodation, Dr. Bolton found that with the object of vision at five or six metres, convergence relatively to the object viewed was greater than for the most distant vision; so that this first effort of accommodation is accompanied by *more* than its corresponding proportion of a metre angle. But from this "point of greatest relative convergence" the disparity gradually lessens up to the point of coincidence.

6. As vision approaches from the point of coincidence relative *divergence* sets in and gradually increases till at ten inches from the eyes there is an outward deviation* of a covered eye to 4° or 5°. It varies in different individuals from 0° to 8°. The deviation begins in less than half a second after the eye is covered, and continues to advance at decreasing speed (which can be measured at any point) for from half a minute to a minute and a half.

7. The deviation is exactly similar whether one eye is placed subjectively in the dark or both receive one or more images—at least with physiological eyes.

There are four methods of measuring it; when the blind-spot method gives different results from the other three the case is one of those pathological ones in which the mind has learned to discriminate the position of each eye separately.

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* In some myopes there is convergent squint in distant vision, and divergent squint in near vision. It will be seen that this is only an exaggeration of the natural tendencies.

8. This divergence in near vision is greatest on first opening the eyes in the morning; it diminishes rapidly during the first half hour, and more slowly through the day, and undergoes a temporary fall after the principal meal.

9. The convergence of *near* binocular vision is therefore composed of three factors (see Fig. 2). The "initial

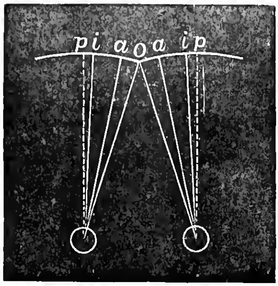

FIG. 2.

Fig 2. The three elements of convergence in binocular vision of a near point *o*. "Initial" convergence brings the axes from parallelism (*p p*) to *i i*. "Accommodative" convergence brings them to *a a*, and the desire for single vision brings them from there to *o*. An excluded eye deviates outwards twice the distance *o a*, because the seeing eye which would otherwise deviate through *o a* is kept from doing so by the innervation which turns both eyes to the right or left and which acts equally on both.

convergence" is the starting point. To it is added the accommodative convergence; and lastly the "fusion supplement," excited by the desire for single vision, makes up what deficiency is left. Since this last function is a tireful one it is of value to know the proportion of work which falls to it, and which is exactly represented by the deviation measured by the camera.

We should expect the initial convergence and the accommodative convergence attached to a definite number of dioptres—say four dioptres—to be similarly

affected by circumstances, and indeed we do find that they both increase as the day wears on. It is singular, however, that a meal temporarily increases the former, while it diminishes the latter. The accommodative convergence may be greatly increased by intestinal disturbance, such as that which causes nightmare, and in children temporary squint.

10. As vision approaches close to the near point the increasing mechanical resistance to both accommodation and convergence necessitates the expenditure of continually increasing effort to do each equal increment of work. But the effort required increases in much quicker ratio for the former than the latter, so that each dioptre of accommodation requires an effort great enough to cause more than a metre angle of convergence.

Hence the natural relative divergence noted at ten inches gradually lessens till just at the near point it may be nil, or even give way to relative convergence.

11. The oculo-motor muscular sense is purely central; the same contraction of a muscle is mentally appreciated in one way or another according entirely to the central source of the effort. For,

12. When one eye is covered, the object seen by the other eye *seems* to move in the direction of the covered one; the *apparent* movement is at half the rate, and through half the angle of the *real* deviation of the excluded eye, showing that half the deviation is due to contraction of the external rectus by a ranging centre, and the other half to relaxation of the internus from the converging centre. The mind estimates lateral position by the former, but only distance by the latter.

13. A fixed object seen by a stationary eye may *appear* to move in some experiments, and the same fixed object seen by a moving eye may appear stationary in others, according to the innervations in play.

Hering's law of two separate innervations is thus in many ways confirmed.

14. It is probable that the great physiological differences shewn by the camera in the extent of the connection between the two efforts of convergence and accommodation in different individuals account for the fact that squint results as a consequence of many cases of hypermetropia, with less refractive abnormality than in other cases where squint shows no tendency to occur. This assists prognosis, and accounts for what was an unexplained fact.*

15. There are two well-known tests in common use, in which a prism (base vertical) is placed before one eye. For the distant test a light is generally used, and the result, of course, depends on the distance of the light—whether the distance is greater or less than that of the patient's point of coincidence ; if greater, there will be relative convergence ; if less, relative divergence. The distance of the flame is, therefore, not a matter of indifference where exact inquiry is wished.

16. In the ordinary near-vision test the test-object is a vertical line with a dot on it. The prism duplicates the dot and elongates the line. But I find the overlapping portions of the two linear images still excite the desire for single vision, so that physiological deviation is not detected, though, no doubt, the desire is so weakened that gross pathological defects are revealed in many cases ; though, even for these, the test is not uniform, since the desire may be weakened in very different proportions in different trials according to the length of the overlapping portions, and more particularly by any accidental rotation of the prism. The least accidental inclination of the card from the vertical also causes fallacy.

To obviate this, Messrs. Pickard and Curry have made me an obtuse prism, to be used with dots only, or

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* See section on hyperopic strabismus in Landolt's "Accommodation and Refraction of the Eyes," 1886.

with a device engraved upon the card which measures the deviation at the same time. This prism is shown in Fig. 3.

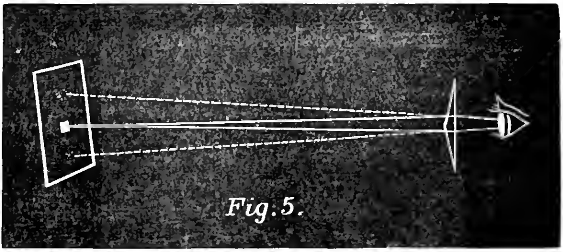

FIG. 3.

Fig. 3. Side view of the obtuse prism held before the right eye The false images seen by the right eye are dotted. The true central one is seen by the left eye; when it passes to the right of the line of the other two diplopia is heteronymous, when to the left of it homonymous.*

17. In both the above tests, if the apex of the ordinary prism lies to the right or left of the vertical line through its centre, there ensues horizontal displacement of the image seen through the prism, which is of course just the thing to be avoided, since the *purpose* of the test is to ascertain the relative horizontal position of the images. The difficulty of avoiding this accidental rotation is increased by the fact that very few prisms are correctly marked at base and apex—a statement that can easily be verified by those who have prisms if they will test their own.

The obtuse prism escapes these errors, for it does not need marking at all.

Of the three dots (or three flames) seen by the patient it is easy for him to tell whether the central one lies to the right or left of the imaginary line between the other

* To detect vertical diplopia rotate the prism till the false images are horizontal. They will sometimes run together, but often not. A flame may be used instead of a dot. But the best way to measure vertical diplopia is to use a stereoscope with a horizontal line in one half and a vertical line in the other, graduated in tangents of degrees. The patient simply reads the number at which the horizontal line crosses the other.

two, especially if before opening the left eye he adjusts the prism till the two images seen through it appear to him vertical.

18. When one eye is excluded from vision it is not steady like the seeing one, but subject to slight waverings. In binocular vision the fusion apparatus has to correct these irregularities as well as any definite deviation.

19. Images seen in a dark field, one by each eye, at slightly different levels, even when the difference in level is great enough to prevent their fusion, are often kept near each other by the desire for it.

This tendency decreases rapidly with increasing difference in level, and is not perceptible when the images are separated by a vertical angle of 2° or 3°.

This false desire for fusion, even when the images are those of different objects, and at different levels, may be great enough to overcome the true desire for the fusion of the horizontal double images of a single object, provided the latter are separated by a greater interval than the former; though this depends in part on the *order* in which the two desires are aroused, and the way in which one or other of the images attracts attention by suddenly coming into view. For these experiments the images were those of small rectangular luminous apertures in a field otherwise totally dark.

20. When double images are coloured differently, the desire to unite them is weakened, but not removed.

21. *Intermittent binocular vision* can be caused by rapidly alternating it with monocular. According to the frequency and duration of the intermissions the desire for single vision can be so affected as that deviation shall be either prevented or retarded, or arrested at any part of its course, or made slowly to retrogress. But for want of the necessary machinery (only recently devised), the rapidity and duration of the different intermissions could not be studied.

22. *Attention* exerts a marked effect on the desire for single vision. There is no desire to correct even

horizontal diplopia of a single object, of which both images are accurately focussed on the retina, if attention is withdrawn from them by being directed to a new image wherever it may lie, so long as it is not too near the horizontal level of the others. The new image may even lie between the other two if the difference in level is not less than 2°. On this fact indeed the "central" method of using the camera depends.

It is evident that even in ordinary vision there exists *unfocussed* diplopia of objects beyond and within that one specially regarded for the moment, and this diplopia is disregarded by the mind.

But we now speak of *focussed* diplopia, without binocular vision of any other object, and with only *monocular* perception of another image sufficient to withdraw attention. Since fusion is a purely reflex act, this phenomenon illustrates how great an effect psychical concentration or abstraction may exert on reflex activities. It may also be compared with the quickening of the faculties which results from the former, and the blunting of them which attends the latter. To put it generally, the mere presence of perfectly defined double images in a dark field excites no sensory-motor action to unite them so long as attention is directed elsewhere.

23. When an object is viewed, not far from the median plane, with one eye or both, it is referred to the line which bisects the binocular angle of convergence, and which therefore unites the apex of that angle with a point midway between, and slightly behind, the centres of the two eyes. So far then Hering's rule holds good; but when the object is one far removed from the median plane, the rule ceases to be true, for such an object is mentally referred to a greater distance from the median plane than it really occupies, even when both eyes are concentrated upon it. The reason, I believe, is that in natural vision great conjugate deviations of both eyes to the right or left are seldom called for, so that the mind associates effort and work according to their required

proportion for these slight obliquities. For greater obliquities the effort required (by which alone the mind can judge) becomes increasingly disproportionate to the work it accomplishes.

24. The original paper contains a geometrical study of direct oblique vision which shows that were accommodation and convergence as inseparable as they were once thought to be there would be diplopia of most objects outside the median plane—either homonymous diplopia or heteronymous, according to their distance from it.

25. That the attainable dissociation of the two efforts bears some relation to the requirements of oblique vision is, I think, shown by the fact that the limits of each pretty closely coincide. Diplopia can only just be corrected, at the extreme limit of oblique vision.

26. Several considerations appear to show that the two efforts are primitively in large measure dependent, and that after its development the connection gradually loosens as age advances.

27. To estimate the effect of a superadded ranging effort to right or left on the mutual relations of these other two efforts of convergence and accommodation, the camera shown in Fig. 4 was devised.

With this Dr. Bolton obtained unlooked-for results. He found very great diminution of accommodative convergence in oblique vision, so that it made very little difference to the position of a dissociated eye whether the other was engaged in near or distant vision.

Moreover the direction of least deviation was not with straight-forward vision, but when the object lay somewhat to the left of the median plane. He accounts for this by the fact that obliquity of vision is more often called for to the right side than to the left, owing to the frequent use of the right hand in writing, &c.

When conjugate obliquity of 35° was attained he found rapid darting oscillations of the image seen by a dissociated eye, suggestive of the etiology of coal-miners' nystagmus.

I think it doubtful whether this phenomenon would occur in all cases, especially without prolonged oblique vision.

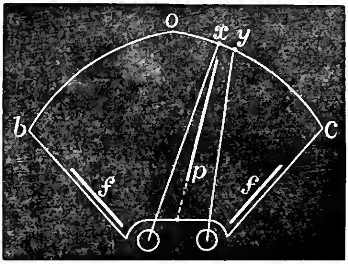

FIG. 4.

Fig. 4. Outline of the "crossed camera." *p* is a partition moveable round an axis near the root of the nose. *x* and *y* are apertures at different levels, each moveable to any position independently of the other. *f f* are fans used instead of the central partition to measure convergent squint. This camera analyses the conditions of oblique vision, and measures squints at any different required obliquities.

28. Squints may be measured and analysed in several ways by the cameræ—divergent and convergent ones by the first, and convergent by the second. They are indicated for cases of small degree and doubtful diagnosis.

There is one variety of squint, the measurement of which baffles all ordinary methods of Strabismometry (unless Javal's), for which the blind-spot use of the camera is well adapted.

It is that in which the visual field of the faulty eye has shifted its position so that when the "working" eye is covered there is no attempt to rectify the mal-position; the in-turned eye still looks at the surgeon as obliquely as before, so that all subjective methods, like, *e.g.*, Lawrence's Strabismometer, are useless.

The blind spot forms in these cases all the better index because the point of acutest vision now lies nearer its test-margin than before.

Its actual angular distance as tested, subtracted from $12\frac{1}{2}^\circ$, gives the degree of the squint.*

29. The paper contains a table of angles to enable the best distance between the optical centres of spectacles to be prescribed as well as their strength. By its means the angular or prismatic effect of any degree of decentration is seen at a glance; and we may also find the decentration required to produce any desired prismatic effect.†

30. When a prism is combined with a lens the effect of the combination upon the position of the eye is not truly expressed by the deflecting angle of the prism unless the lens is a convex one, and the object is viewed at its focal length.

When the object is within that distance the effect on convergence is less—when beyond it greater. But with *concave* glasses the effect is *always less.*

This fact is not likely to be taken account of in practice, but in speaking of metre-angles exactly it needs to be remembered.

31. When a comparatively near object is viewed through a lens which totally relaxes the accommodation, the other eye, when dissociated, refuses to deviate quite out to the initial position, but stops short of it by about 1° in my own case, owing to the sense of nearness, or "knowledge of proximity," an explanation for which I am indebted to Dr. George Berry.

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* Instead of taking the average distance of the blind-spot from the fovea as the criterion of the original point of departure, the actual distance may be measured in the working eye and assumed to have been the same in the other, if of equal refraction.

† To *measure* the distance between the optical centres by sunlight, hold the spectacles at the distance of their focal length from a metric rule; the two spots of light map out the distance. With artificial light multiply this inter-focal distance on the rule by the distance of the flame from the spectacles, and divide by the distance of the flame from the rule. The best way, perhaps, is to place the spectacles half way between the other two, and then halve the result.

ZONULAR CATARACT AND DENTAL MALFORMATIONS.

By Edgar A. Browne.

Senior Surgeon, Liverpool Eye and Ear Infirmary.

I may perhaps be allowed to add a few confirmatory words by way of postcript to Mr. Story's paper on this subject (O. R., Vol. V., p. 277).

Some years ago I was led to suppose that the connection between infantile convulsions and malformations of the teeth is peculiarly intimate, but that the association of zonular cataract with the fits is not quite so close. My own experience seems to teach me that when zonular cataract is found with a history of fits, the teeth will certainly be malformed; when zonular cataract occurs independently of fits, the teeth will *probably* be good, and that in many cases of infantile convulsions the subsequent injury to the teeth is observed, the lens being unaffected.

Eliminating doubtful cases, and those complicated by indications of congenital syphilis, I find I can lay my hand readily on the following genuine cases as evidence on this point:—

Case 1.—William L.	17.	Z.C.	Fits.	Malformed teeth.
,, 2.—Eliza N. (mother)	29.	Z.C.	Fits.	Malformed teeth (reported).
,, 3.—Eliza N. (child)	8.	Z.C.	None.	Good teeth.
,, 4.—Marian W.	14.	Z.C.	Fits.	Malformed teeth.
,, 5.—Thomas W.	8.	Z.C.	None.	Good teeth.
,, 6.—Philip K.	10.	Z C.	Fits.	Malformed teeth.
,, 7.—Eva W.	11.	Z.C.	Fits.	Malformed teeth.

Here we have seven cases, five the subjects of fits and exhibiting malformed teeth, two with no history of fits and the teeth uninjured. We may in like manner group Mr. Story's cases.

Case 1.—Nannie B.	19.	Z.C.	Fits.	Malformed teeth.
,, 2.—Margaret O'C.	15.	Z.C.	Fits.	Malformed teeth.
,, 3.—Bernard C.	21.	Z.C.	No fits.	Good teeth.
,, 4.—Hugh M.	13.	Z.C.	Fits.	Malformed teeth.
,, 5.—May M.	33.	Z.C.	No notes.	Incisors good, [molars gone.
,, 6.—Clara S.	23.	?	No notes.	Good teeth.
,, 7.—Wm. R.	4.	Z.C.	No fits.	No notes.
,, 8.—Wm. L.	17.	No note.	Fits.	Malformed teeth.
,, 9.—Michael C.	24.	Z.C.	No notes.	Malformed mo- [lars. good incisors.

Here we find in nine cases the cataracts, fits, and malformed teeth together in four cases (1, 2, 4, 8); two with no history of fits (3, 7), of which one is noted as having good teeth, but there are no notes of teeth in Case 7. Two cases may be eliminated as having no note of the fits (5, 9), and Case 6 is described as rather doubtful. This makes five cases completely noted, of which four have the history of fits and the defective teeth, while one has had no fits and has good teeth. Adding these to my cases, we may say out of a total of eleven cases nine present the trifold symptoms, and two present the lenticular defect without the preceding convulsions or the sequent dental deformity.

Let me note in this connection a young lady, A. E. K., with slight asthenopia due to H A s $+ 0{\cdot}50°$ at $90°$ in each eye, V with eye $= \frac{20}{20}$; one fit in infancy, marked rocky teeth, lenses examined with $+ 20°$, quite free from dots or markings.

One or two points of interest in the cases perhaps deserve mention :—

Cases 2 and 3 are mother and daughter. Case 2: Eliza N., 29. Had two inflammatory attacks, blinding her, in childhood. Had fits in infancy. Front teeth at present artificial, but remembers the originals were very bad and rough. Zonular cataracts. Central opacities with triangular markings—spoke-like radii. Periphery in R. not much affected. Eliza

N., junr., 8, daughter of the above. Zonular cataracts very typical. Never had fits ; second incisors coming through ; fine well-shaped teeth.

The fact that the mother had convulsions and that the child had not, though both have zonular cataracts, points to the existence of a common cause for the lenticular injury, apart from the fits. At all events, it tells against the theory that the opacities are mechanically produced by partial separation of the layers during the violence of the attack.

Case 4.—Marian W., 14. Zonular cataracts; opacities extend nearly to margin of lenses in both eyes. Very subject to fits in infancy. Teeth—upper incisors central, enamel imperfectly developed about half way down the surface of the teeth, grooved and roughened by dots (as if wormeaten). From below this the dentine, entirely destitute of even rudimentary enamel, projects as chisel-shaped process, considerably smaller than the upper part of the tooth, rough and corrugated. Laterals chisel-shaped. with pointed apices, enamel coarse but strong. Canines dome-shaped, with the enamel ending with a concavity, from which projects a sharp nipple destitute of enamel. If the enamel had been continued over this nipple, the ordinary conical form of the canine would have been presented. Lower incisors, the enamel ends very near the lingual edge of the teeth, the projecting dentine swells slightly, so as to form a rough groove between the two structures. Canines dome-shaped, with blunt dentine nipple.

Case 6.—Philip K., 10. Zonular cataracts. Fits in infancy. Teeth—central incisors very short; enamel, lower part of tooth, rough and very sharp ; laterals, enamel nearly to edge, very rough. Canines dome-shaped, with thin flange of dentine projecting anteriorly and very sharp. Lower incisors short enamel, canines have a central projecting flange.

The distinctive characteristic of the genuine convulsion-tooth, unaffected by congenital syphilis, is the shortness of its enamel. The dentine projects from beyond the enamel edge like an overgrown schoolboy's legs through his trousers. Inasmuch as the tooth is divided by a more or less well-marked line, below which the enamel is imperfect or absent, and the surface of the

exposed dentine (or imperfect enamel) is more or less rough and honeycombed, having a rude resemblance to rocks fretted by the intermitting action of the waves, I have in teaching used the term "tidal-mark tooth." I find the name is appreciated by students, as fixing the idea in the mind, and is found to be sufficiently descriptive. It establishes the distinction from the notched and pegged teeth of congenital syphilis. The characteristics common to the two may be occasionally seen in the same individual, as the victims of congenital syphilis sometimes have cataracts and a history of fits. Occasionally the dentine projection from the tidal-mark tooth is worn away or broken off, leaving an apparently short tooth with a somewhat concave border. This is occasionally mistaken for the syphilitic notch. But the tidal-mark tooth is not a pegged tooth within the limits of the extension of its enamel, whereas the syphilitic tooth is pegged to the whole extent of its corona and its enamel is complete.

EXNER (Vienna). On the Function of the Retinal Periphery and the Seat of After Images. *Graefe's Archiv. f. Ophthalmol. Band XXXII., Abtheil I., p.* 233.

Exner points out that the periphery of the retina is highly sensitive to changes in surrounding objects although but little fitted to recognise stationary objects. And among changes in surrounding objects it is not only particularly sensitive to motion, but it has a distinct tendency to translate into motion all changes that by any possibility allow the transformation. He illustrates this by a familiar example. When two telegraph wires really parallel but apparently intersecting are seen sideways and the head moved up and down, the apparent intersection will move from side to side. In walking along a road this apparent movement will attract attention as if a bird flew past, although we have previously been in no way conscious of the wires themselves. The same applies to changes of colour in indirect vision, and accordingly the question of after images must not be investigated with rotating plates and variously coloured sectors. Exner has therefore devised an instrument

by which the light of a gas flame seen through a small aperture in the tube containing it may be obscured at regular intervals by means of a rotating disc with indented periphery. For the details of the instrument we must refer to the original. Up to a certain number of rotations, *i.e.*, up to a given number of obscurations, the light flickers, but above this it becomes steady. Before reaching this limit, however, Exner noticed that the apparent oscillations of clearness were much greater when the flame was viewed indirectly than when looked at directly. Exner attributes this to a relative slowness of the macula in receiving impressions.

Again, when the flame was only partly obscured each time so that the comparison was between different degrees of light Exner found that at a certain rate of rotation the light appeared constant to direct vision, but the moment the eye was fixed on a point, even a few degrees to one side, the light began to flicker. These experiments show that the retinal periphery is much more delicate in its perception of changes than is the centre, this both in the case of different degrees of brightness and different rates of change.

Still more striking, however, is the sensitiveness of the retinal periphery to stationary and changing objects. In a white screen the size of a plate ten holes 8 mm. in diameter are made irregularly, and these are seen black because of a black background. By a simple arrangement one of the holes can be covered with a white object, so obliterating it. If now the screen is moved to such a distance, and so far off the fixation point, that the holes cannot be counted with any certainty, still it will make a most distinct impression if a hole is added or removed. It is seen in the process of being added or removed although, immediately before and after, it is not seen in the ordinary sense of the term. This sensitiveness of the retinal periphery, Exner believes, is associated with its ready exhaustibility and rapid regeneration, and he points out that were our knowledge received entirely from the retinal periphery it would have a very different character from that which it possesses. He suggests also that it is questionable to what extent animals possess a macula lutea similar to the human—that most probably the major part of their experience is of the nature given by the retinal periphery.

Exner then proceeds to criticise the view held by Filehne that the seat of after images is in the brain. To this conclusion he opposes two facts: (1) Although twenty-four retinal impressions per second may become continuous, if the retina is stimulated directly by the induced current so as to produce an impression less than those just referred to, sixty stimulations may be made per second and still there is no continuous impression. (2) The persistence of an after image is markedly influenced by the alteration of the circulation in the retina produced by pressing on the globe. From these points Exner concludes that the seat of after images is in a part of the retina more peripheral than the fibre layer; the positive after images in a layer nearer to the vitreous, the negative in one nearer to the choroid.

Hack (Freiburg). On the Operative Treatment of Exophthalmic Goitre. *Deutsch. Med. Wochensch., No. 25, 24th June,* 1886.

The patient was a young lady, aged 17 years, who since earliest childhood had suffered from bilateral exophthalmos without previously any other symptom. During the same period she had had severe nasal obstruction. Five years before she had suffered from a severe attack of acute rheumatism, which affected chiefly the upper extremities, and relapsed several times. Careful examination of the heart never showed any affection of that organ at the period of attack. Six months, however, before being seen by Hack, she began to complain of stabbing pain in the præcordial region, and severe palpitation. This was temporarily relieved by digitalis, but relapsed. The pulse was 100, the exophthalmos became more marked, and a previously slight enlargement of the left lobe of the thyroid body became much more distinct. There was marked cardiac hypertrophy, the impulse extending two fingers' breadth outside the nipple line. She was brought to Hack on account of the severe nasal obstruction, and showed then marked widening of the palpebral fissure and Graefe symptom. The greatly swollen mucous membrane on the posterior part of the inferior turbinated bone was cauterised, with the surprising result that on the following day the exophthalmos on the operated side had almost disappeared. A similar result followed operation

on the left side a few days later, but more slowly and less complete. The palpebral fissure and movements became more natural, the change having been apparently most striking. A few months later Hack was informed by the attending medical man that the improvement had persisted, and moreover, that the palpitation and cardiac hypertrophy had disappeared, and the enlargement of the left thyroid lobe had much diminished.

After a short discussion of the theories as to the causation of exophthalmic goitre, Hack concludes that it resulted in his case from reflex dilatation of the orbital vessels, produced by the peripheral irritation of sympathetic nerve fibres acting through the vasomotor centre. This theory he supports by adducing cases of asthma, migraine, and conjunctivitis relieved by rhinological operation. He quotes Michel's comparison of the retrobulbar fat to a sort of erectile tissue, and asks if there is difficulty in believing that reflex dilatation of its vessels may protrude the eyeballs, just as swelling of the bronchial mucous membrane from dilatation of its vessels may produce asthma. He even suggests that glaucomatous tension of the globe may be set up by similar reflex influence.

In view of his own and similar cases he recommends a careful rhinoscopic examination wherever exophthalmic goitre is accompanied by nasal symptoms. Considering the helpless position we are in therapeutically as to this affection, the suggestion will probably be welcomed, but requires farther confirmation.

Szili (Buda-Pesth). On Erythropsia. *Klin. Monatsbl. f. Augenheilk. Juli*, 1886, *p.* 259.

Szili agrees with Benson, Hirschler, Pflüger, and others in attributing this symptom to a condition of the retina, not of the visual centres; but he differs from Hirschler in considering it due to a hyperæsthesia of the red perceiving elements of the retina from previous over-illumination of the eye, rather than an insensitiveness of the retina for the more refrangible rays. He supports his opinion by Hirschler's own experiment, which shows that looking through a stenopaïc aperture will restore natural vision in such cases. The symptom occurs chiefly in cases of cataract excision with broad iridectomy, but it may occur where the lens is present, even where the eye is

perfectly normal, the necessary circumstance apparently being intense illumination as in aphakia, a broad coloboma, mydriasis, or even prolonged exposure to sunlight.

Szili cites the case of a medical man who was in the habit of seeing objects coloured red as he was about to drop off to sleep, the symptom disappearing at once if he got thoroughly wakened up. Also a case of papillitis, followed by atrophy, in which erythropsia was a prominent symptom. Such cases, and the occurrence of uniocular erythropsia, negative, he considers, the central origin of the symptom.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, NOVEMBER 11TH, 1886.

J. W. HULKE, F.R.S., President, in the Chair.

President's Address.—Mr. Hulke gave a brief sketch of the changes which had occurred in ophthalmic practice within his own recollection. In the days of his pupilage, the opportunities of studying eye diseases were few. Of the general hospitals, Guy's alone had a special department. The Royal London, the Westminster. and the recently instituted Central London, were the special hospitals. The ophthalmoscope was then unknown, and its discovery a little later caused a revolution in the treatment of diseases of the eye. He well remembered the pleasure with which he first saw the fundus through Helmholtz's original ophthalmoscope. When he began his studies in 1848, Guthrie was the leading surgeon at the Westminster Ophthalmic; he was a strict disciplinarian, a clear-headed man, and an energetic, prompt, and dexterous operator. His method of treating severe trachoma by nitrate of silver and lard was widely known, the preparation being called Guthrie's black ointment. For entropion he used to make a scar parallel to the diseased lid with fuming nitric or sulphuric acid. In those days, amaurosis, or one form of it, was supposed to be due to constriction of the optic nerve by the muscle at the apex of the orbit, and accordingly tenotomy of all the recti was performed for its relief. The old operation of squint was very different

from the subcutaneous method of modern days. Cataracts were then always treated by discission—an operation that was modified by Jacob, of Dublin. Keratonysis had from very early days been the recognised operation for the soft cataract of early life, and still held its grounds. He inclined to the belief that these cataracts were congenital rather than infantile. Extraction was regarded as the test of dexterity in an operator; and, as then performed, required far more dexterity than the operation of their own days, the linear extraction of von Gräefe. Amongst other operations, he mentioned iridesis and iridodesis, which, as performed by its inventor, the late Mr. Critchett, was a beautiful operation, but in other hands had not proved a great success, and had fallen into disrepute on account of the danger of iridocyclitis. A. von Gräefe's great discovery of iridectomy as a means of permanently reducing the tension in glaucoma was referred to as the greatest advance of modern times; it would make Gräefe's name famous for ages to come. The address concluded with a brief account of the old method of excising the eyeball, and of the changes which have followed the introduction of anæsthetics.

Sarcoma Growing from the Dural Sheath of the Optic Nerve.—Dr Brailey. Microscopical preparation and drawing. The patient was a woman, aged forty-two, whose left eye protruded $\frac{3}{4}$-inch directly forwards. Both lids were large, flaccid and doughy, apparently from enlargement of the subcutaneous veins. The conjunctival vessels on the outer side were enlarged. The eye-movements were much limited to the inner side, and still more so in other directions. The pupil was without direct reflex or associated action, but indirect reflex action was present. P. L. wanting. The optic disc was rather raised, slightly ill-defined and whitish; its vessels enormously tortuous, lying in loops on its upper portion. Some small white striated inflammatory patches were found just beneath the disc margin. The other eye and the rest of the body showed no evidence of disease. The mass was excised together with the eyeball, and surrounded the optic nerve, and was much thicker on the outer side. Posteriorly the nerve tapered off to a fibrous tract in the substance of the tumour. The growth measured about $1\frac{1}{4}$-inch in each diameter, and occupied the space within the recti muscles,

from the apex of the orbit close up to the eyeball. It was firm and pretty smooth, and scantily provided with blood-vessels. Microscopically, it was connected with the peripheral part of the dural sheath. Fibrous trabeculæ started from the latter, and formed by their anastosmosis loculi, in each of which was imbedded a rounded abundantly-nucleated mass. The nuclei were large and oval, and were imbedded in a scanty finely-fibrillated basis substance. They had a whorled arrangement, as if originally deposited round the sheath, or in the place of a blood-vessel. Two similar rounded, nucleated, whorled masses had extended into the optic nerve in the place of the central artery and vein respectively. Passing further from the dural sheath, the trabeculæ generally became slighter, and the nucleated masses larger and more rounded. The author said that tumours of the optic nerve-sheath were rare; he had not seen one presenting this character. It must be described as a fibro-sarcoma. Its history, commencing eight years previously, with very gradual proptosis and early loss of sight, and afterwards marked by gradual painless increase, was remarkable in connection with the abundantly nucleated character of the mass, and the absence of deposits in other parts.

The President commented on the long time which such tumours take to grow. In the Moorfields museum there was, he said, a very similar tumour; it was removed from a woman, aged twenty-two, who came with extreme proptosis, and was quite blind. The mass was adherent to the dural sheath of the optic nerve, and was a sarcoma fibrous rather than cellular. It had been growing for twelve or fourteen years.

Dr. Sharkey said that such tumours were certainly very rare. Billroth had pictured one in his surgical pathology. He remembered to have seen one case in which, in the frontal lobe of the brain, there was a similar spindle-celled growth with concentric arrangement of cells.

Cases illustrative of the Treatment of Glaucoma.—Mr. G. E. Walker showed patients. The first, a man, aged forty-three, was seized with acute glaucoma in August, 1885. His illness commenced with chill, pain in the left side of the head and left eye. He was treated for two months with drops,

during which time his sight deteriorated, but pain became less. A second attack was similarly treated for other two months, after which sight was completely lost. In April, he came under Mr. Walker's care, when his sight had been extinct for a fortnight, and the eye stony hard; eserine was used, and cyclotomy done; the pain was stopped at once and finally. On the third day after the operation, and subsequently, eserine drops were used. There had been no pain since, and the tension of the eye was almost normal.

Mr. Walker referred to two cases of glaucoma treated by him by convex lenses, which he had brought under the notice of the Society in April, 1886. One of them was seen in Dublin on August 30th, and was found to be quite well, and had remained so since. The other, now shown, was the patient who had been brought to London to the former meeting, but who had an attack of glaucoma on the evening of the meeting, and could not be shown. His symptoms had been relieved by wearing a convex glass of 2 D.

Dr. Brailey said that he had seen the last-mentioned case in April last, and could confirm the statement that the patient was then recovering from an attack of acute glaucoma; he was a very intelligent man, and was wearing glasses of + 2 D. This treatment was, however, not new; up to a certain point, it was an effective means of prevention. He agreed to some extent with what Mr. Walker said about iridectomy, which he held to be harmful in certain cases of chronic, not severe, glaucoma.

Mr. Nettleship asked Mr. Walker whether he considered the right eye free from glaucomatous symptoms. The tension was increased, the disc cupped, the retinal veins distended. To his thinking, the case was not cured or free from risk.

Mr. McHardy thought the patient presented all the ordinary symptoms of chronic glaucoma; there was increased tension and cupping, which certainly was not physiological. He wanted to know what proof there was that the left eye had failed three or four days after the iridectomy; it had, perhaps, got into a bad state before the operation. It was quite common in these cases for the first eye to fail and the second to do well. He hoped that they would hear more of the case subsequently, and see some charts of the field of vision.

Mr. Hutchinson said that, in regard to the last case, he was afraid the news was too good to be true. Cases would be oftener cured if it were not so, for it was the almost constant practice of patients to use convex glasses in an early stage of the disease.

Mr. Walker, in reply, said he held that these cases proved the correctness of his view that excessive action of the circular ciliary fibres was the cause of glaucoma. He agreed with much that Mr. Nettleship had said, and did not deny that the attacks had left something, but that something was already there when he first saw the patient, and it had not increased. As to the iridectomy in the other eye, it was very well done, but he held that a well-performed iridectomy caused increased likelihood of glaucoma. He would report the case again. As to the question of originality raised by Dr. Brailey, he had conceived the idea more than ten years ago, and had spoken of it at Moorfields again and again, and it was in print eight years ago. If anyone could show a claim prior he would abandon his.

Unilateral proptosis.—Mr. G. E. Walker also showed a boy, aged 16, with proptosis of the right eye. He had slipped down stairs, and had hit his head so as to render himself unconscious for three days. There had been no bleeding from ears or nose, or other proof of fracture. On recovery, he noticed a swishing noise in his head, and, five months later, his right eye became engorged and protruded; the left also was for a little while engorged. The disease had slowly progressed since. The diagnosis lay between a communication between the artery and the cavernous sinus and a true aneurysm. He had been in favour of trying the common carotid, but Mr. Hutchinson and Mr. Holmes had advised delay, and he was anxious to hear the opinion of the members of the Society.

Mr. Hutchinson thanked Mr. Walker for his great zeal in bringing cases to the meetings of the Society. He was much interested in the case of proptosis, having seen the boy two months previously. The diagnosis lay between an aneurysm of the carotid artery and a communication between the artery and vein; the turgescence of the retinal veins was very

marked, and from this and other facts he believed there was a communication between the artery and the cavernous sinus. As to ligature of the common carotid, his own opinion was that it would not succeed. It was to be remembered, also that cases sometimes lasted a great many years without serious inconvenience. This boy was in good general health, and did not suffer from more than the discomfort occasioned by his appearance and the noise in his head.

Dr. Brailey had seen a very similar case in which double proptosis had come on after an injury.

Mr. Eales mentioned a case of orbital aneurysm developed after an injury to the head in a coal-mine ; a large visible pulsating tumour, with murmur and thrill, rapidly appeared. Iodide of potassium failed, the question of operation was raised, but it was decided to wait. Before the next consultation, the noise in the head suddenly ceased, and the pulsation, murmur, thrill, and proptosis disappeared. It was evident, therefore, that spontaneous cure might take place. He asked whether in this case, digital pressure had been tried.

Mr. Frost referred to the case he had shown some years previously, in which the symptoms had existed for over thirty years.

The President said that, five years previously, he had tied the common carotid artery in a case of this kind, but the symptoms had reappeared within the last year; he had seen that happen before. The diagnosis, he thought, depended upon the character of the murmur; if continuous, it indicated arterio-venous communication ; if intermittent, aneurysm. He agreed with Mr. Hutchinson as to the chronic nature of the disease. A case of Sir William Bowman's showed the difficulties of diagnosis. A woman who had all the symptoms of orbital aneurysm had her common carotid artery tied, and died a few days later from secondary hæmorrhage. On examination was found, not aneurysm, but thrombosis of the cavernous sinus.

Mr. Lang showed three patients: 1. A man, aged 60, with rodent ulcer; 2. A girl, aged 10, with sarcoma of the orbit; 3. A girl, aged 16, with lupus of the conjunctiva.

OPHTHALMOLOGICAL SOCIETY.

NOVEMBER 12, 1886.

THE BOWMAN LECTURE.

PARASITICAL DISEASES OF THE EYE.

BY WILHELM VON ZEHENDER,
PROFESSOR OF OPHTHALMOLOGY IN THE UNIVERSITY OF ROSTOCK.

We can here give only a brief outline of this important address. For a full report the reader is referred to the weekly journals.

The older ophthalmologists recognised in the organ of vision certain parasites which are visible to the naked eye. Mackenzie enumerated the following:—1. Filaria; 2. Monostoma and distoma oculi humani; 3. Echinococcus hominis; 4. Cysticercus cellulosæ. Von Nordmann was the first to accurately observe the natural history of living creatures in the eye. He examined an immense number of eyes of fishes, amphibians, birds, and mammals, and found therein several specimens of different entozoa. In the human cataractous lens he found two kinds—filaria and monostoma. Gescheidt and von Ammon found similar filaria in a lens, and between an opaque lens and its capsule they found distoma. The skill and accuracy of these observers cannot be doubted, and it is remarkable that although our microscopes are much better than those of fifty years ago, and many cataractous lenses have been examined, neither monostoma nor distoma has since been found. Nearly the same may be said of the filaria in the human lens, though this parasite is, among the negroes of Congo, common in other parts of the eye.

Echinococcus has been met with in the orbit; about forty cases have been published. It causes more or less protrusion of the eyeball, but does not otherwise impair the sight; it may easily be removed by operation.

Cysticercus was known in the anterior parts of the eye before the introduction of the ophthalmoscope; now it is found to be much more frequently present in the deeper parts. Thus von Graefe, of Berlin, who was the first to see a

cysticercus with the ophthalmoscope, found this parasite once in the lens (the only observation of the kind); once in the orbit; three times in the anterior chamber; five times under the conjunctiva; and more than eighty times in the retina and vitreous. It is met with much more frequently in the North of Germany than elsewhere.

Two species of tapeworm inhabit the human intestine; the one with a crown of hooks round its head, the other without. The cysticercus, the first stage of the tapeworm, shows a corresponding difference in the two species; the one has hooks, the other none. The cysticercus with hooks lives especially in pigs, sometimes in great number. The cysticercus without hooks lives in cattle; never in pigs. Eggs of the tapeworm enter in one way or another into the human stomach, and there their thin covering is dissolved by digestive action, and the living cysticercus set free. It is probable, though not proved, that the minute animal passes then through the wall of a blood vessel, and is carried along in the circulation until stopped, as, for instance, in the choroid, and that it then creeps out, as does a white blood corpuscle in inflammation. It tends to enter the vitreous body with more or less impetuosity. If seated in the choroid, or under the retina, the movement of the worm gives rise to a large detachment of the retina, and sometimes the observer can see that it really creeps through the retina into the vitreous. This process cannot be performed without causing the patient great discomfort. It often excites a vehement inflammation with insupportable pain, and produces dense opacities in the vitreous, so that the animal can hardly be distinguished with the ophthalmoscope. If seated in the retina it does less harm, and generally gets more easily into the vitreous, without exciting such disagreeable sensations. Then, the vitreous remaining clear, the parasite can be well seen with the ophthalmoscope. In a few cases the crown of hooks and the movements of the animal have been distinctly seen. There is no parasite whose life in the living human body can be studied with less trouble and with greater exactness than that of a cysticercus in the eye.

Practically more important than the foregoing are those minute parasites belonging to the lowest forms of life which are visible only under the highest powers of the best micro-

scopes. Pasteur's demonstration that the air owes its power of decomposing organic substances to the minute particles, germs of low forms of life, suspended in it, and Lister's practical application of the fact, gave a new direction to the study of disease, and ophthalmology has advanced in consequence.

For practical purposes the known micro-organisms may be divided into two classes—the pathogenic and the non-pathogenic. The eye of the rabbit has commonly been employed as the test, but it must be remembered that this test is insufficient; some microzoa are dangerous to rabbits and relatively innocuous to man, and vice versa. For example, gonococcus and staphylococcus aureus, the most dreaded of all microzoa, because of their great tendency to provoke suppuration, are in the rabbit's eye relatively indifferent micro-organisms.

Again, the same microzoon acts differently at different times on the same tissues and on the same individuals. The causes of these differences are not yet understood. They may lie in changes occurring in the tissues at different periods of life, or effected by the action of antagonistic microzoa. The microzoa may change the soil, or they may devour or kill each other; their effect probably varies with their number; their activity may be modified by changes in their own constitution.

The air to which the surface of the eye is exposed contains the germs of all varieties of these parasites. The fact that the eye does not more frequently become infected by them may depend partly on their passing away along the lachrymal canals, partly upon the conjunctiva being a suitable soil only under certain conditions.

It is now acknowledged that primary suppuration after cataract extraction depends on infection.

Phlyctenular conjunctivitis is undoubtedly a common adjunct of the scrofulous constitution, but may nevertheless be a parasitic disease, the micro-organisms finding a more favourable soil in the conjunctiva of the scrofulous subject than in that of a healthy child. This view is supported by the beneficial effect of powdering the eye with calomel. A portion of the calomel is converted by the action of the saline tears into perchloride of mercury, which is soluble, and an excellent

antiseptic. This remedy appears to be better even than the ordinary solution of the perchloride, perhaps because it supplies the perchloride in a nascent condition.

Purulent conjunctivitis is undoubtedly a parasitical disease. The micro-organism residing in the gonorrhœal matter, first discovered by Neissier, and named by him "gonococcus," is identical with the micro-organism found in purulent ophthalmia.

Trachoma is in all probability parasitical, though on this point authorities are not agreed. The microzoon, described under the name of diplococcus of trachoma, is, as regards its form and configuration, very like the aforesaid gonococcus, only it is much smaller. It represents a very small ball, cleft by a tiny line, which can only be seen by the most powerful microscopes. This diplococcus can very well be cultivated in different nutrient soils, whereas the gonococcus can only be cultivated in serum of blood; in other nutrient soils it does not grow. The diplococcus of trachoma has its seat inside the trachoma follicles, but outside the cells; whereas the gonococcus lives in the cells or at the outside of the conjunctiva—at least, does not enter deeply into this membrane.

The danger of suppuration which attends operations on the eye in presence of an obstruction in the nasal duct is attributable to the presence of pathogenic microzoa in the retained secretion.

The serious characters of ulcus corneæ serpens and hypopyon keratitis can hardly be explained except by infection.

Mycotic keratitis presents an ulcer from which a number of fine straight lines radiate outwards. These lines have been proved to be dilated lymph canals filled with minute spherical bodies believed to be micro-organisms.

Microzoa have been found in a chalazion; they have been seen in the internal parts of the eye—in the iris, in the choroid, in the ciliary body, in the optic nerve. Local and general tuberculosis has been successfully produced by inoculating the bacilli of tubercle into the anterior chamber of a rabbit's eye. It is even maintained that sympathetic inflammation is produced by the wandering of micro-organisms along the optic nerve and through the chiasma to the other eye.

Bacteriology is at the present time a very young and incompletely developed science; it cannot yet answer all the numerous questions arising every day. Some day the etiology of human diseases and bacteriology may be found to be nearly identical sciences.

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